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STATE COLLEGE RECORD

announcements for the session 1953-1954

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COLLEGE CALENDAR

	1953 Fall	1954 Winter	1954 Spring	1954 Summer
College faculty meeting	Sept. 16			
[1,2] Orientation and testing of freshmen	Sept. 17-20	Jan. 4	Mar. 23	
[1,4] Registration of freshmen, sophomores, juniors, seniors and graduate students	Sept. 21-22	Jan. 4	Mar. 23	June 9
[1,3] Registration of new students admitted with advanced standing	Sept. 22	Jan. 4	Mar. 23	June 9
Classwork begins	Sept. 23	Jan. 5	Mar. 24	June 10
Anniversary Day (not a holiday)	Oct. 3			
[5] Last Day for registration or for changes in registration	Sept. 30	Jan. 12	Mar. 30	June 15
Midterm reports due	Oct. 30	Feb. 5		
Thanksgiving holiday	Nov. 26-29			
Final examinations begin	Dec. 12	Mar. 12	May 29	
Term Ends	Dec. 17	Mar. 17	June 4	July 14
Commencement exercises			June 6	

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[1] An extra fee is charged for registration after the day designated.

[2] Freshmen should be present for the first Assembly in Pullen Hall at 7:15 p.m., September 17, 1953.

[3] New students with advanced standing of fewer than 45 credits register with the freshmen. See footnote 2.

[4] Each student should register at time to be designated.

[5] A student may be permitted to drop a course without a grade of "F" within 21 calendar days from the date that classes begin for each regular term. (Ten days in summer term.)

1953

JANUARY

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[1] Retired July 1, 1953.
[2] Resigned July 1, 1953.

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[3] Retired February 1, 1953.
[4] Deceased.
[5] On military leave.

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* On leave 1952-53.

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* On leave 1951-52.
** On military leave.

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WILLIAM EDWARD SHINN, *Chester H. Roth Professor of Knitting, Head, Department of Knitting, School of Textiles.*
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JOHN WILLIAM SHIRLEY, *Dean of the School of General Studies and Professor of English.*
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STANLEY G. STEPHENS, *William Neal Reynolds Professor of Genetics and Agronomy and Head of Genetics Faculty.*
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** On leave of absence 1952-54.

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GRADUATE STUDENTS WITH APPOINTMENTS

Neal P. Alexander
Sigurd L. Anderson
Irvin Charles Anderson
James H. Anderson
John Stevens Andrews, Jr.
Jay Lawrence Apple
Thomas J. Army
Harvey James Arnold
James Edward Ashburn
Aldos Cortez Barefoot, Jr.
William E. Barnett
George Edgar Barrier
Homer Edwin Beam
Albert W. Blackstock
Edward Alan Borchers
James Nelson Bowerman
John I. Boswell, Jr.
Mackay Birdsall Bryan
Charles Douglas Bryant
John Edward Buckhalt
Nathan Stanley Caplan
Melvin W. Carter
John M. Champion
Charles W. Coggins, Jr.
Cecil Conley
Nicholas C. Costes
Daniel N. Cote
Arthur J. Coutu
Donald F. Crossan
Elige W. Culvahouse, Jr.
Edmund G. Cummings
Jorge De los Rios
Richard D. Dillender, Jr.
Joseph S. Dinsmore, Jr.
Byrd Keating Dozier
Orest J. Dutka
James Roy Edwards
Robert Lee Edwards
J. Edwin Faris, Jr.
Jack Fleischer
Spencer M. Free, Jr.
Charles M. Freeman
Rudolf Jakob Freund
John J. Gajda
Charles E. Gates
William J. Gehweiler
Steven Gerick
Willie C. Godley
David G. Gosslee
Irving W. Gower
Ernest C. Grant
Velvl William Greene
George R. Gwynn
Glenn Price Haney
Lester Hankin
Donald G. Harris
Clarence A. Hart
Robert H. Hartman
Alvin H. Heinbuch
Robert E. Hiller, Jr.
Henry F. Howden
Charles A. Idol
Wm. John Jakobi
Ray Nelson Jarvis
Wiley C. Johnson, Jr.
Bobby L. Joyner
Eugene J. Kamprath
Rolf Kaufman
Harvey E. Kennedy
William D. Kemper
Sidney A. Kilsheimer
Donald E. Kizer
Walter J. Klubowicz
Harsukh N. Kothari
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James T. Lazar, Jr.
Richard I. Levin
William T. Lewish
Robert R. Libby
James S. LoCicero
Harold R. Lominac
G. Gilbert Long
Wm. Henry Long, III
Wilmoth C. McArthur
John A. McCommas
Sturgis McKeever
Charles F. MacLeod
Nicholas C. Matalas
David E. Matney, Jr.
Jesse Lynn Mellor
Paul D. Miller, Jr.
Forest O. Mixon, Jr.
Raymond A. Moore
Harold Mott
Joseph R. Nelli
Robert J. Nichol
E. J. Niemierzycki
Edward C. Nixon
Charles W. Nystrom
B. I. Parsegyan
Walter R. Peck
Ralph J. Peeler, Jr.
Bertha M. Pepin
Jack W. Permenter
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II. GENERAL INFORMATION

THE COLLEGE

Establishment.—The North Carolina State College of Agriculture and Engineering is one of the Land-Grant Colleges established under the provisions of the Morrill Act, passed by the Congress of the United States, June 2, 1862. The first session of the College was that of 1889-1890. Prior to that date, the funds received by the State under the Land-Grant Act had been used by the University of North Carolina, at Chapel Hill.

The name, The North Carolina College of Agriculture and Mechanic Arts, used in the establishment of the College, was changed by the General Assembly—the Legislature of the State—in 1917 to its present form.

In its session of 1931, the General Assembly passed an Act, of which the following is the first section: "That the University of North Carolina, the North Carolina State College of Agriculture and Engineering, and the North Carolina College for Women are hereby consolidated and merged into 'The University of North Carolina'."

This Act placed the three institutions under one Board of Trustees and one President, the separate affairs of each institution being in charge of its own Chancellor. The effect of the Act, by correcting unnecessary duplication and focalizing the work of each of its members, has tended to create a strong, unified State University.

Location.—The State College campus of one hundred twenty-five acres lies within the limits of Raleigh, a mile and a quarter west of the State Capitol, on United States Highway, Route 1. Adjoining the campus westward, occupying four hundred forty-five additional acres, are the college poultry yards, and the Central State Experiment Farms. A mile still farther westward, the College has acquired a tract of thirteen hundred acres, which is maintained as livestock farms by the Department of Animal Husbandry and Dairying. The part of this tract—about 500 acres—not adapted for these farms is being used by the Department of Forestry for demonstrations and development.

Organization.—The organization of State College has as its objectives campus teaching, extension teaching, and research.

Campus teaching occupies the School of Agriculture, the School of Forestry, the School of Engineering, the School of Education, the Textile School, the School of Design, the Graduate School, the School of General Studies, and the Summer Session. The Schools are organized for teaching by departments. The details of the organization, the equipment, and the work of each school and department are given under the various headings in the latter pages of this Catalog.

The Division of Military Science, including the Reserve Officers' Training Corps students of all classes in all schools, is placed immediately under the College Administration.

Extension teaching is directed under the Division of College Extension. The work is closely coördinated with the work in the regular departments of the college. In certain short courses, most of them in Agriculture and in Engineering, extension overlaps with campus teaching. The whole state is covered in the activities of the Agricultural Extension Service.

Research is conducted, by individuals or by departments, very generally at State College. Specially organized work is done through the Agricultural Experiment Station, Department of Engineering Research, and the Textile Research Department.

The Campus.—The campus of State College presents an agreeably rolling terrain with adequate space west and south for expansion. Located on the eastern edge of the Piedmont region of the state, within twenty-five miles of the coastal plain, opportunity is afforded for a pleasing variety of trees and shrubs in the landscaping. Fortunately, in the early years of the College a long-range plan for growth was made. This plan is now being intelligently followed.

Under the sections of the Catalog devoted to schools and their departments and to divisions are placed descriptions of buildings, laboratories, and facilities of each of these.

General Service Buildings.—Holladay Hall, named for Colonel Alexander Quarles Holladay, first President of the College, 1889-1899, contains the general administrative offices of the college.

The D. H. Hill Library, named for Doctor Daniel Harvey Hill, President of the College, 1908-1916, was dedicated in 1926. It contains now over 106,000 volumes, exclusive of government documents, and pamphlets.

The Y. M. C. A. building, the erection of which was made possible by a donation from the Rockefeller Foundation, serves the religious and social life of the College.

The Dining Hall, with kitchens, storage rooms, pantries, refrigerators, and other mechanical devices in the center and basement, has at each side, front and rear, a spacious dining hall. The service is on the cafeteria plan.

The Frank Thompson Gymnasium is named in honor of Frank Martin Thompson, a distinguished athlete and graduate of State College, Class of 1910, who was killed in service during World War I. It is used for Physical Education classes and recreational activities.

The Infirmary, completed for army use during the war, is a model of a small, special hospital.

Pullen Hall, named in honor of R. Stanhope Pullen, donor of the first sixty acres of college land, has classrooms on the first and basement floors, and on the second floor, the college auditorium.

The Power Plant, centrally located, furnishes heat, electric power, and hot water to all buildings on the campus using these services.

The William Neal Reynolds Coliseum, named in honor of William Neal Reynolds of Winston-Salem, whose niece, Mrs. Charles Babcock, was the donor of the first contribution toward the Coliseum's erection, was used for the first time on December 2, 1949. It has a seating capacity of 12,000 and is suitable for a wide range of functions, including commencement programs, large meetings, ice skating, agricultural expositions, industrial events, and inter-collegiate athletic contests.

Twelve College Dormitories now in use accommodate approximately 3000 students. Other students room in homes in the vicinity of the campus and in fraternity houses. Information in regard to dormitories is sent by the Registrar to applicants accepted for admission to the College.

INFORMATION FOR APPLICANTS

Admission

1. The first step toward admission to State College is to get from the Registrar, who is to be addressed at State College Station, Raleigh, an application form. After this blank has been filled out and the high school certificate signed by the principal or the superintendent of the high school, the form is returned to the Registrar for his decision on admission.

The certificate must contain a statement from the school last attended of the good moral character of the applicant.

2. Undergraduate students may be admitted as regular, special, unclassified, or auditors.

(1) A regular student is one who is registered in a curriculum. Women may be admitted as regular students provided they register in one of the regular curricula.

(2) A special student is a person of mature age already engaged in some vocation in which instruction is desired. Upon presenting a satisfactory record of education and upon recommendation of the Dean of the School concerned, such persons may be admitted without the usual entrance requirements.

Special students are not eligible for a degree, nor does work done as special students have value for credit toward a degree. These students must meet all college rules and regulations for regular students. A special student cannot represent the College in any intercollegiate contest nor become a member of a fraternity.

(3) An unclassified student is one admitted to the College to take certain courses for credit, but who is not interested in securing a degree at this institution.

An unclassified student must be of mature age (over 21) and cannot carry more than six credits per quarter.

If, at a later date, an unclassified student desires to change to a regular status, his credits will be evaluated for the major he desires to take. Where credit is allowed, he will receive the grades earned. Credits earned as an unclassified student will not be accepted in a specific curriculum unless the applicant has had the proper prerequisites.

Students in residence and former students are not eligible to enroll as unclassified students until they have been out of school for at least two academic years.

Unclassified students will be under the jurisdiction of the Dean of the School of General Studies, unless the applicant desires technical work, in which case the individual will be under the Dean or Director of Instruction of the School concerned. Admission of unclassified students will be by recommendation of the respective Deans.

Unclassified students must meet the same entrance requirements as regular students and all college rules and regulations for regular students.

Unclassified students will pay fees on the same basis as graduate students.

(4) An auditor is an individual who is not a regular student, but desires to visit a class without taking part in the discussion. Such a student cannot receive credit for the course and does not take quizzes or examinations. However, he is expected to attend classes regularly.

3. Requirements for admission of regular students.

(1) Sixteen years is the minimum age for admission.

(2) Graduation from a State accredited high school, or an approved preparatory school, and fifteen units of credit, specified and elective as indicated below, are required for admission to the freshman class of four-year and five-year courses.

(3) Applicants graduated by non-accredited four-year high schools in North Carolina may be admitted by passing successfully an entrance examination.

(4) In exceptional instances a person of mature age may be admitted by the Dean of a School on the basis of his ability to carry the regular work of a curriculum in that School.

(5) Subjects and units of credit (A unit is allowed for a subject pursued for a year, five periods a week, each period being at least forty minutes, and successfully passed in a high school accredited by the North Carolina State Department of Public Instruction or other preparatory school accredited by competent authority.):

	Units of Credit
English: Grammar, Composition, Literature	4
†History: United States or equivalent	1
††Algebra	1.5
††Plane Geometry	1
*Solid Geometry	.5
Science	1

The remainder of the required fifteen units will be accepted from the academic record presented except that not more than a total of one unit will be accepted for activity courses such as physical education, music, band, and military science.

(6) Foreign students who do not have a satisfactory command of the English language will be required to take a special English course until they acquire a mastery of English. This course will include vocabulary training in the student's major field of study.

4. Admission of Non-Resident Students. Admission of students who are not residents of North Carolina will be considered according to the number of such students who can be admitted and the scholastic standing of the individual student.

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* Solid Geometry is required only in the School of Engineering, in Agricultural Engineering and Agricultural and Biological Chemistry. A special course is offered in college for applicants who do not present this credit for entrance. No college credit is allowed for the course.

† A student not offering American history for admission must take a sequence of three terms of American history or two terms of American history and one term of American government as a part of his college program.

†† A special course without college credit is offered in college for these deficiencies.

5. Advanced standing is allowed on work done in approved colleges upon presentation of a certificate or transcript, duly signed and sealed, to the Director of Registration. The transcript is evaluated in the Registration Office to determine the maximum amount of credit and is then sent to the Dean of the school concerned for a detailed evaluation of credits which can be used in the curriculum selected. No applicant will be considered unless his previous college grades indicate that he has at least an average scholastic ranking. This is usually interpreted as a "C" average.

Because of the scholastic requirements imposed upon resident students, advanced standing credit cannot be allowed for courses passed at other institutions with the lowest passing letter grade, or corresponding numerical grades. At least one year in residence is required for a degree.

Expenses

Undergraduate

1. The total college expenses of a student resident of North Carolina for the regular college year need not exceed $950.00, for a nonresident of this state, $1,150.00. These amounts include the cost of room, an estimate for board, heat and lights, tuition, fees and deposits, books, drawing instruments, laundry, and necessary incidentals. They do not include clothing, pocket money, or other incidentals.

2. Nonresidents of North Carolina pay an additional tuition charge. The College Administration has defined a nonresident student as a person who comes into North Carolina from another state for the purpose of attending college.

In order to draw a clear line between resident and nonresident students, the Administration has ruled that all students whose parents have not been domiciled in North Carolina for more than six months immediately preceding the day of their first enrollment in the institution shall be termed nonresident students, with the following exceptions:

(1) Students twenty-one years of age at the time of their first matriculation who have resided in North Carolina for more than one year preceding the day of their first enrollment;

(2) Children of regular employees of the Federal Government stationed in the State of North Carolina; and

(3) Children of regular employees of the Federal Government who are employed outside of the State, but who through law are permitted to retain their North Carolina citizenship.

Students cannot claim a change in their resident status after matriculating. Students furnishing incomplete or incorrect information in order to obtain the special State-resident status shall be liable for dishonorable dismissal.

3. Applications for credit must be made to the Business Office of the College prior to registration day. Applications made later, if granted, will require a special fee of $2 and possibly also the fee for late registration.

4. For each failure to meet deferred payments as scheduled, a fee of $5 is charged.

5. Tuition and fees for residents of North Carolina as regular under-

graduates or as special students scheduled for more than nine credit hours are as follows:

	Fall Quarter	Winter Quarter	Spring Quarter
Tuition	$50	$50	$50
College Fees	26	26	26
Student Activities	13	11	9
Athletic Fee	8	5	2
Students Fees	* 2	2	
General Deposit	20		

Student Fees include subscription to student publications of the school in which registered.

Note.—Tuition and Fees are subject to change by the Board of Trustees without advance notice.

6. The general deposit, is refundable at the end of the year, after covering loss of or excessive breakage of college property, or other indebtedness to the College.

7. Non-residents of North Carolina (in all curricula) will pay an additional $70.00 tuition per quarter.

8. Expenses also include the following: room rent, from $18 to $35 per quarter; books and supplies (estimated) $20 to $35 per quarter; for those taking drawing:—instruments, board, T-square and other sundry drawing equipment and supplies (books already included in book estimate above) estimated $35.00 to $45.00. This equipment should, with proper care, last throughout one's stay in college and for many years thereafter in professional work.

9. College fees include those for registration or matriculation ($5.00, in no case refundable), for hospital and medical attention, for library and lectures, for laboratories and classrooms, and for physical education.

10. Student-activities fees include those for student government, student publications, and general student activities.

11. Forestry Field Laboratory Fees:

All students enrolled in the School of Forestry will pay a field laboratory fee of $10.00 each year at the time they first register during a school year.

12. Audits: In the regular term, all regularly registered students are entitled to audit courses. See regulations and fees below under "Graduate, Special Students and Auditors."

13. Room Rent:

Fall Term—Payment of room rent for Fall Term reservations must be made on or before the date indicated when room assignment is made. A reservation may be cancelled and payment refunded through September 10. No room rent will be refunded after this date unless the student withdraws from College.

Winter Term—Payment of rent is to be made during the period Decem-

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* $3 for students in Agriculture and Agricultural Education.

ber 1 and December 10. Students who reserve a room and pay rent for the Winter term will receive no refund unless they withdraw from College.

Spring Term—Payment of room rent is to be made during the period March 1 and March 10. Students who reserve a room and pay rent for the Spring term will receive no refund unless they withdraw from College.

If a student withdraws from College, a charge of 75 cents per day will be made and the balance of rent refunded. Room rent is paid on a term basis. If a student occupying a dormitory room does not reserve and pay rent for a room for the succeeding term he must vacate his room and turn in the keys by the end of the term for which the rent has been paid. Rent will be charged at the rate of 75 cents per day for the period between terms and until the room is vacated and keys turned in.

14. Board at the College Cafeteria may be paid in cash for each meal, or in tickets sold at the Cafeteria for the convenience of students.

15. Applicants who desire information regarding part-time employment should address their inquiries to the Self-Help Secretary, College Y.M.C.A.

16. A refund of the amount paid the College, less the registration fee, is made to a student withdrawing within ten days from the date of registration; on withdrawal later, no refund will be made except of the general deposit.

17. Freshmen, unless living at home with their parents, are required to room in college dormitories. Freshmen are not permitted to live in fraternity chapter houses at any time during their first year in college.

18. Diploma Fee. All candidates for a Baccalaureate Degree are charged a Diploma Fee of $7.00 during the last term before the degree is awarded.

19. When a transfer student has been approved for admission, a $2.00 Transcript Fee will be requested. This is non-refundable and is in addition to other fees. This fee should not be sent until requested.

Graduates, Special Students and Auditors

1. Subject to the approval of the Board of Trustees, tuition and fees for graduate students will be as follows, effective at the beginning of the fall term 1953-54:

		FALL TERM		WINTER TERM		SPRING TERM	
Group	Credit Hours	Tuition	Fees	Tuition	Fees	Tuition	Fees
1	10 or more . .	$50	$49*	$50	$44	$50	$37
2	9	30	38	30	33	30	26
3	Less than 9 .	25	38	25	33	25	26

* Students in Agriculture and Agricultural Education pay additional $1.

Non-resident students will pay additional tuition each term as follows: Group 1, $70; Group 2, $42; Group 3, $35.

Graduate students holding college appointments (i.e., receiving a regular monthly salary check) will be charged resident rate of tuition.

Graduate students who have completed course requirements and are in residence for thesis work only will be charged $10 per term tuition, plus all fees.

Faculty members desiring to take one course per term will be charged $25 tuition per term, but no incidental fees. They will not be entitled to any of the privileges provided by the fees.

2. Undergraduate special or regular students, will pay a $2.00 registration fee for each registration and $5.00 per credit hour ($7.00 for non-residents) for all courses scheduled totaling nine hours or less. Those scheduling more than nine hours will pay regular fees. The payment of Student Activity fees is optional with special students or regular students carrying nine hours or less. Special students do not receive academic credit.

3. Auditors will pay $5.00 for each course audited. Regularly enrolled graduate students may audit one course free of charge each term except during the summer, but will be charged $5.00 for any additional audits. Regularly enrolled undergraduate students paying full academic fees will not be charged for audits. (Note—undergraduate students are not permitted to audit any course which has not been previously passed.)

FINANCIAL AIDS AND SCHOLARSHIPS

AGRICULTURE:

The Finley Loan Fund is a memorial to William Wilson Finley by the Southern Railway Company, of which Mr. Finley was, at the time of his death, president. It is designated for needy students in Agriculture.

"American Hardware Agricultural Scholarship" is awarded annually by the American Hardware and Equipment Company of Charlotte, North Carolina, to a freshman in the School of Agriculture whose home is in Mecklenburg County. The award carries $200 annually and is awarded by the Faculty Committee on Scholarships and Grants-in-Aid after recommendations are received by the Association of Vocational Agricultural Teachers of Mecklenburg County.

"The Harvey B. Hunter Scholarship" was established by H. Bradford Hunter, Jr. and his brother, Charles A. Hunter, of Charlotte, North Carolina, in honor of their father. The value of the Scholarship is $100 annually and is awarded to a freshman in the School of Agriculture from Berryhill High School in Mecklenburg County. Recommendations are made to the Faculty Scholarship Committee by the principal and agriculture teacher of Berryhill High School.

The Burpee Award in Horticulture—An annual award of $100, established in 1945 by Mr. David Burpee, President, W. Atlee Burpee Company, to assist financially and to recognize outstanding students in Horticulture. The award will be made at the end of the third term of the junior year and will be based upon "scholarship, interest in research and practical experience" of the student. Students majoring in Vegetable Gardening and Floriculture will be given preference.

Sears-Roebuck Foundation Scholarships. Awards of $100 or more are made each year to from fifteen to twenty graduates of North Carolina High Schools who wish to enter any curriculum in the School of Agriculture or the curriculum in Vocational Agriculture. Preference is given to farm boys and awards are made on the basis of need, scholastic record in high school, participation in 4-H Club or F.F.A. projects, and other community activities. Funds for the scholarships are provided by the Sears-Roebuck

Company. Application blanks may be secured from the Dean of Agriculture and must be filed with his office by June 15 each year.

The Sears Sophomore $200.00 Scholarship is awarded by the Sears-Roebuck Foundation to the freshman Sears Scholarship holder who makes the best scholastic record during his freshman year.

The Planters Cotton Oil and Fertilizer Company Scholarships: From funds donated by The Planters Cotton Oil and Fertilizer Company of Rocky Mount, The Planters National Bank and Trust Company of Rocky Mount awards annually to a resident of Nash or Edgecombe counties one scholarship worth $400 per year for four years. Recipients must be in the upper twenty-five per cent of their graduating high school class and must maintain the same level of scholarship at North Carolina State College to continue receiving this award for the period of four years. Recipients must also enroll in the School of Agriculture or the Department of Agricultural Education. Application for the scholarship is made to the Planters National Bank and Trust Company of Rocky Mount.

Alpha Zeta Scholarship Award: The fraternity of Alpha Zeta awards annually one or more scholarships, each valued at $100, to a rising sophomore from the School of Agriculture, the School of Forestry, or the Department of Agricultural Education. This award is made during the spring term of each year by the Fraternity of Alpha Zeta.

William J. Peele Scholarship: From funds provided by the will of the late Mrs. William J. Peele, a scholarship of $200 is awarded annually to a student in the School of Agriculture. The recipient may be a freshman or an upperclassman. The scholarship is awarded by the Scholarship Committee of North Carolina State College upon recommendation from the Scholarship Committee of the School of Agriculture.

The National Fertilizer Association Outstanding Student Scholarship in Agronomy is awarded annually to a rising senior in Agronomy. This scholarship provides a plaque and the sum of $200. It is based on scholarship, leadership potentialities, professional interest and contributions to the college community through participation in extra-curricular activities.

Kroger Scholarships, two in number and each valued at $200 are awarded annually to entering freshmen in Agriculture or Agricultural Education. Awards are made for superior scholastic achievement in high school and qualities of leadership as demonstrated in F.F.A., and 4-H Clubs. Funds are provided by the Kroger Company, Cincinnati, Ohio. Application blanks may be secured from the Dean of Agriculture and must be filed with his office by June 15.

The I. O. Schaub Scholarship Award. Established by the farmers and farm women of North Carolina.

From this fund an award of $100.00 will be made annually to a freshman studying Agriculture or Forestry, with preference to be given to a former 4-H Club member. The recipient of this award is to be selected by a committee appointed by the Dean of Agriculture.

DESIGN:

The North Carolina State Garden Club offers annually two scholarships for undergraduate study in Landscape Architecture at the School of Design, North Carolina State College. The scholarships of $250 each, which cover tuition and college fees, are open to any North Carolina resident, boy or girl, who has graduated from an accredited high school or an approved preparatory school within the last five years. Candidates for graduation from high school in June 1953 and armed services veterans are also eligible. The awards will be made on the basis of scholastic record, need, character, personality, and evidence of ability to pursue college study in the field of Landscape Architecture as submitted by the applicant. The North Carolina State Garden Club reserves the right to make no award if such a decision is deemed advisable.

EDUCATION:

Sears-Roebuck Foundation Scholarships
(See Scholarships under "Agriculture," above.)

Planters Cotton Oil and Fertilizer Company Scholarships
(Under "Agriculture" above.)

Alpha Zeta Scholarship Award
(Under "Agriculture" above.)

Kroger Scholarships
(See "Agriculture" above.)

ENGINEERING:

The Luther W. Cartwright, Jr., Memorial Scholarship. Memorializing the late Luther W. Cartwright, Jr., who gave his life in the service of his country, his father, Lieutenant Commander Luther W. Cartwright, has established a trust fund at the North Carolina State College of Agriculture and Engineering to provide for the annual award of a scholarship to be awarded to a junior or senior in Aeronautical Option, Electrical or Mechanical Engineering. The scholarship is limited to one born and living in North Carolina.

Norfolk Southern Railway Company Scholarships and Fellowship:

a. $500 annual scholarship for student of Civil Engineering to son of an employee of the Norfolk Southern Railway Company.
b. $500 annual scholarship for student of Mechanical Engineering to son of an employee of the Norfolk Southern Railway Company.
c. $1000 Fellowship for graduate study in Diesel Engineering, awarded on an annual basis.

The Edward Orton Jr. Ceramic Foundation Fellowship: An annual award of $1,000 is made to a graduate student in Ceramic Engineering. The grant stipulates research must be carried on in the field of kiln fired ceramics.

The Western North Carolina Ceramic Minerals Fellowship: An annual award of $1200 is made to a graduate student in Ceramic Engineering. The recipient must be of American citizenship. The sponsoring firms are the Harris Clay Co., Spruce Pine, N. C.; Consolidated Feldspar Corporation, Kona, N. C. and Trenton N. J.; Feldspar Flotation Corporation, Spruce Pine, N. C.; Feldspar Milling Co., Burnsville, N. C.; North Carolina Feldspar Corp., Erwin, Tenn., and United Feldspar and Minerals Corp., Spruce Pine, N. C. and New York, N. Y.

Sperry Gyroscope Company Awards: To be awarded in the fields of Aeronautical, Electrical, Mechanical and Engineering Research. $1200 Fellowship for research work.

FORESTRY:

"The Hulda Johnston Cox Forestry Scholarship was established by the Ralph K. Cox Paper Company, of Wellsburgh, West Virginia, and Dover, North Carolina. The Scholarship is named to honor the wife of the founder of the company. The Scholarship carries an annual award of $500 and is awarded by the Faculty Scholarship Committee to a sophomore, junior, or senior in the School of Forestry.

The J. V. Hofmann Loan Fund was established by the alumni of the School of Forestry to honor Dr. J. V. Hofmann, the first Director of the School. This fund is designed to assist worthy forestry students who find themselves in temporary economic difficulty.

The I. O. Schaub Scholarship Award
(See "Agriculture" above)

The Alpha Zeta Scholarship Award
(See "Agriculture" above)

4-H CLUB AND F.F.A. SCHOLARSHIPS:

The Chilean Nitrate Educational Bureau offers a four-year scholarship to the 4-H Club member in North Carolina making the best record for three or more years in 4-H Club work.

The Esso Scholarships. Two four-year scholarships awarded to the boys with the most outstanding records in 4-H work for the current year.

The Farmers' Cooperative Exchange Scholarship. A one-year scholarship awarded to the boy doing the most outstanding 4-H work in Poultry for the current year.

The North Carolina Cottonseed-Crushers Association offers to 4-H Club members the following one-year scholarship:

To the member making the best record in a dairy project.

The Sears-Roebuck Foundation Scholarships
(See "Agriculture" above)

The I. O. Schaub Scholarship Award
(Under "Agriculture" above)

Smith-Douglass 4-H and F.F.A. Scholarships: Four scholarships, each worth a total of $1,000 to be paid over a four-year period, will be awarded to freshmen entering curricula in Agriculture or Agricultural Education in September 1953. Two scholarships will be awarded to former F.F.A. members and two to former 4-H Club members who have made outstanding records. Application blanks may be secured from the Dean of Agriculture and must be filed with his office by June 1, 1953.

TEXTILES:

The Syd Alexander Scholarship was endowed by Mrs. Mary R. Alexander of Charlotte, North Carolina, in memory of her husband, the late Sydenham B. Alexander, alumnus and trustee of State College. The returns from the endowment—$5,000—are awarded to a student, a native and resident of Mecklenburg County, North Carolina, who is pursuing a course in the School of Textiles of State College.

The Abraham and Charles Erlanger Textile Scholarships. Memorializing the late Abraham and Charles Erlanger, members of their family have established a trust fund at North Carolina State College of Agriculture and Engineering to provide for the annual award of a four-year scholarship in textiles.

The Coopers Incorporated Scholarships. One four-year scholarship in Textiles established by Coopers Incorporated of Kenosha, Wisconsin. Established to encourage students of Kenosha High School to continue their education. Limited to graduates of the Kenosha High School.

Collins and Aikman Scholarship: Established by the Collins and Aikman Corporation of Roxboro, North Carolina. Any son or daughter of any employee of Collins and Aikman Corporation "who graduates from high school" is eligible to compete for this scholarship.

United Elastic Corporation Scholarship: Two scholarships are awarded annually to sons or daughters of employees of the United Elastic Corporation of Stuart, Virginia.

Fiberglas Corporation Scholarship: Established by the Fiberglas Corporation. This scholarship pays tuition and fifty dollars ($50.00) per month to its recipients. Open only to juniors in the School of Textiles.

Euvaldo Lodi Scholarship: Established by four American textile machinery manufacturers to encourage graduates of Senai Textile School in Brazil to pursue advanced studies at the School of Textiles, N. C. State College. One two-year scholarship is awarded annually. Open only to graduates of Senai Textile School, Rio de Janeiro, Brazil.

GENERAL (ANY SCHOOL OR DEPARTMENT IN THE COLLEGE):

The Student Government Loan Fund is a small loan fund established by the Student Council in 1932 to be loaned to students below the senior class, in small loans (maximum $50.00) and for short periods of time.

Escheats Scholarships. Through the Escheats Fund of the University of North Carolina a number of scholarships are made available each year at the University at Chapel Hill, N. C. State College at Raleigh and the Woman's College at Greensboro. The value of these scholarships at State is $150.00. These scholarships are awarded for one year at a time. Applications must be made directly to the institution the applicant wishes to attend (State, University at Chapel Hill or Woman's College).

The North Carolina State College Foundation has a Scholarship and Fellowship Fund. Money is solicited for this purpose and placed in an endowment, the interest from which is used to grant scholarships as approved by the Board of Directors of the Foundation and the Faculty Committee on Scholarships and Grants-in-Aid.

Athletic Scholarships. All scholarships to athletes are awarded in accordance with the Southern Conference and Board of Trustees Code. For information address Chairman, Scholarship Committee.

The John Gray Blount Scholarships were endowed by Colonel W. B. Rodman, of Norfolk, Virginia, in memory of his great-grandfather. The maximum value of each of the two scholarships is $195.

The L. Reade Powers Scholarship Fund. Established by his brother, Dr. F. P. Powers, for the aid of needy students, primarily orphan boys or girls. This is in the nature of a loan fund to needy boys or girls.

A Student Loan Fund, first established by the State College Alumni Association, amounting now to $34,000, renders assistance to needy students of talent and high character. The Fund includes the Finley Loan Fund of $1,000 (see below), the Frank M. Harper Loan Fund, $200.

At present, loans, restricted largely to juniors and seniors, are made at 5 per cent on good security. Since the fund is comparatively small, new loans are usually made only as old ones are repaid.

The Self-Help Secretary of the College Y.M.C.A. (see page 65) will assist those desiring employment to help pay expenses.

GRADUATE FELLOWSHIPS:

Graduate Fellowships are offered each year by State College, during the current year, thirty-three teaching, twenty-four research fellowships. As the number of these scholarships is limited, application should be made early to the Head of the Department concerned.

Registration

1. Upon his arrival on the campus each member of the freshman class is given a schedule of the exercises of the first week, known as Freshman Week.

2. The dates indicated in the College Calendar for the registration of freshmen, of those applying for advanced credit, and of sophomores, juniors, seniors, and graduate students, must be strictly observed.

3. For registration after the scheduled date, an extra fee of $2 is required for the first day and $1 for each additional day until a maximum of $10 is reached.

4. Directions in detail for registration are furnished each student. The student is expected to follow these directions.

5. Vaccination against smallpox is required at the time of registration unless the applicant furnishes a doctor's certificate indicating he has been successfully vaccinated within two years preceding his registration.

6. Inoculation against typhoid fever, though not compulsory, is urgently suggested for those entering the College. Free inoculation is offered by the College to all students.

7. Every new student is required to have a complete physical examination by his family physician (see Health of Students, page 51).

8. Admission to classes is permitted only after complete registration certified on the official card by the Registrar. All instructors will enforce this rule.

9. Students may drop and add courses during a specified period at the beginning of each term by filing in the Office of Registration a roster change slip signed by their Dean, Adviser, and the instructors concerned. There is a charge of fifty cents for such changes made after registration day. Credit is not allowed for changes unless they are made in this manner.

10. Students may change from one curriculum to another by filing in the Office of Registration a curriculum change card signed by the Dean or Deans concerned. Such changes are effective at the beginning of any term.

11. Students who desire to leave college during a term must withdraw officially. There is no penalty if a student withdraws prior to the last week of classes. Failures are recorded on all courses for students who withdraw during the last week of classes. A student who desires to withdraw should report to his Academic Dean or Director of Instruction for a withdrawal blank and instructions. A student completing one term and not returning the next term need not officially withdraw because this will be taken care of automatically.

Scholarship Requirements

1. Grading System:
   A—Excellent.
   B—Good.
   C—Average.
   D—Passing (without credit points).
   F—Failure.
   Abs.—Absent from examination.
   Inc.—Incomplete.

   Explanations:

   a. A student absent from a final examination shall not be allowed to make up the examination until the student presents a notice from the Dean of Students indicating to the professor that the absence was excused. An unexcused absence from examination is recorded as "Fa" on the student's record; an excused absence becomes "Fa" if not made up by the end of the next term the student is in residence.

   b. A student who has at least a "C" average on a course can receive an incomplete grade, at the discretion of the teacher, for incomplete laboratory work, or for an extension of time on a required term problem when the student presents to the professor an excuse from the Dean of Students indicating a serious interruption in the student's routine not caused by his own negligence. (Graduate students should secure their approval from the Associate Dean of the Graduate School.) An incomplete grade should not be given for regular recitation or lecture course work.

   An incomplete grade must be made up during the next term a student is in residence unless the department concerned is not able to allow the make-up then. In the latter case the department should notify the student and report to the Office of Registration when the course can be completed and the student must make up the incomplete during that time. Any incomplete not made up during the required time becomes a failure and is recorded as "Fi".

   c. A grade of "Fd" is posted if a student has unofficially "dropped" a course for which he was scheduled, or has officially dropped a course after the final date for dropping courses without failures.

d. A "failure" may be made up only by repeating the subject. Required courses failed must be repeated. Such a repeat course must be regularly scheduled on the student's roster.

EXCEPTION:

Any senior who fails a course within three terms of graduation (summer school counts as one term), and fails only one course during that term, may apply to the Office of Registration for permission to remove the failure by taking a re-examination on that course.

(1) If, however, a senior fails more than one course during one term, and removes all but one of these deficiencies by repeating the course, or courses, and if he has had no other re-examination, he may apply at the end of his last term in residence for permission to take a re-examination to remove that failure.

(2) Permission to take any re-examination must be obtained from the Office of Registration, and a fee of $3.00 must be paid the Business Office.

2. General Information:

a. The North Carolina State College operates on what is known as the credit-point system. Term credits represent the number of hours of work satisfactorily completed. Honor or quality points are determined by the grade earned. The values assigned to each grade are as follows:

A—3 points for each credit hour
B—2 points for each credit hour
C—1 point for each credit hour
D—0 points for each credit hour
F— −1 point for each credit hour

All excused absences from final examination and all incompletes not removed during the next term in residence and all unexcused absences from final examination are counted as failures. Net quality points are those earned by grades less those subtracted for failures and unexcused class absences.

b. For the purpose of these scholarship regulations, a year of residence is any school year (September-June) at State College or at another collegiate institution in which a student completes two or more terms.

c. In applying scholarship rules a summer session shall not count as a term. However, credit hours and quality points earned during the summer session and by correspondence and extension at State College will be considered as part of a student's cumulative record.

d. Within 21 calendar days from the date that classes begin for each regular term, a student may be permitted to drop a course without a grade of F. (For a six-weeks summer term, within 10 calendar days from the date that classes begin.) Absence from all classes for one week or more because of illness may entitle a student to a load reduction without penalty. Permission for such load reduction must be secured from the Dean of Students before the roster change slip is obtained from the adviser.

e. During the first year of residence at this institution and the summer term immediately following, a student may repeat freshman courses passed the previous term for the purpose of improving his scholastic record. Such courses may be repeated only once. When a course is repeated, only the last grade will be considered in the college scholarship standards. Required freshman courses taken during the spring term may be repeated by correspondence during the summer immediately following the spring term. After the first year in residence a student may repeat a course previously passed only by "Auditing" the course. At the student's request, the teacher shall allow an auditor full participation in all class activities.

f. Scholastic Load: A student may not carry over 21 hours, nor less than 12 hours, during a regular term without securing the approval of the Dean (or Director of Instruction) of his school.

g. A student is scholastically eligible for graduation when he has satisfied all the specific requirements for his department and school and has earned as many net quality points as total earned credit hours.

h. Credits, grades, and residence are interchangeable among the three units of the Consolidated University.

i. Regularly enrolled students who go to other summer schools to take courses which they expect to transfer back to State College for credit are required to have these courses approved in advance by the Director of Instruction.

j. Undergraduate students may audit only courses which have previously been passed.

k. Class Attendance Regulations: A student is expected to attend every meeting of each class. All students classified as freshmen at their first registration in any scholastic year are allowed a total of five unexcused class absences per term throughout the entire year without loss of credit points. One credit point is lost on the sixth unexcused absence, and one for each three thereafter. Sophomores, juniors, and seniors, so classified at their first registration in any scholastic year, are allowed a total of 8 unexcused absences per term without loss of credit points. One credit point is lost on the ninth unexcused absence and one for each three thereafter. A student who is absent fifteen (15) times in any term without a satisfactory reason will be placed on probation.

l. Re-examinations for Seniors: Any senior who fails a course within three terms of graduation (summer school counts as one term), and fails only one course during that term, may apply to the Office of Registration for permission to remove the failure by taking a re-examination on that course. If, however, a senior fails more than one course during one term, and removes all but one of these deficiencies by repeating the course, or courses, and if he has had no other re-examination, he may apply at the end of his last term in residence for permission to take a re-examination to remove that failure. Permission to take any re-examination must be obtained from the Office of Registration, and a fee of $3.00 must be paid the Business Office.

Copies of attendance regulations in detail are available to all students in the Office of the Dean of Students.

3. Reduced Load:
   a. A student is on a reduced load whenever he has fewer net quality points than credit hours. A student on a reduced load will have his academic load regulated by the Dean or Director of Instruction in the school in which he is registered, with the understanding that he cannot schedule more than sixteen credit hours exclusive of physical education.
   b. A student who is on a reduced load must show substantial progress. He is liable to dismissal at any time by the Readmissions Committee if class attendance, scholarship, or attitude warrant it.
4. Requirements for Continued Residence:
   a. A student failing to earn a minimum of six credits during his first term of residence and a minimum of eight credits during each term thereafter shall be notified by the Office of Registration that he must apply to the Readmissions Committee for permission to continue in residence without interruption or for readmission at a subsequent date. Passing grades in non-credit courses will be considered the equivalent of actual credits in meeting the requirements of this rule. Neither incomplete grades nor excused absences are counted as passing in applying this rule.
   b. A student who entered the college without any transfer credits and who at the end of his first year of residence has net negative quality points (less than a "D" average) shall not be eligible for continuing in school unless, by September 1 of that year, an overall "D" average has been attained by attendance at the summer session of this institution, at the University of North Carolina at Chapel Hill, or at the Woman's College, or by taking correspondence courses from the N. C. State College Extension Division. Such courses must be completed in time for final grades to be in the Office of Registration by September 1.
   c. A student who does not have net quality points equal to credit hours (less than a "C" average) by September 1 after his second year of residence here or elsewhere, or any September 1 thereafter, shall be notified by the Office of Registration that he must apply to the Readmissions Committee for permission to continue in residence without interruption or at a later date. Transfer students (including those who receive no advanced standing) who have attended another institution as much as 2 terms will be allowed only one year of residence here to earn a "C" average.

   Note—The above regulations a, b, and c also apply to unclassified undergraduate students and special students. These students must pass all work scheduled when the total is less than prescribed in section a.
5. Readmission of Students:
   a. Readmissions Committee. The Readmissions Committee shall consist of the Deans or Directors of Instruction of the seven schools

and shall act as a sub-committee of the Faculty Council. This Committee shall elect its own chairman and shall have power to act within the limits of regulations which follow. The Director of Student Personnel shall be an advisory member of this committee.

b. When a student has been dropped from the rolls of the College for scholastic reasons, he will be considered for readmission by the Readmissions Committee only after he has fulfilled such requirements as may be set forth by the Dean or Director of Instruction of the school in which he is registered.

c. When a student is dropped for failure to have a "C" average (see 4.c.) he will not normally be eligible for readmission for at least one year. Exceptions may be made to this ruling if, in the opinion of the Readmissions Committee, the student has made substantial progress in his scholastic record. It shall be the duty of the Readmissions Committee to determine what constitutes substantial progress.

Honors in Scholarship

1. Honors in scholarship for the year are awarded those students who earn twice as many credit points as credit hours during the first two terms.
2. High honors in scholarship for the year are awarded those students who earn two and one-half times as many credit points as credit hours during the first two terms.
3. Honors in scholarship at graduation are awarded those students who have earned during their entire residence at this institution twice as many credit points as credit hours.
4. High honors in scholarship at graduation are awarded those students who have earned during their entire residence at this institution two and one-half times as many credit points as credit hours.
5. Public announcement of honors and high honors for the year is made, and graduation with honors or high honors is published in the College Catalog.
6. Dean's List: Any junior or senior having a cumulative average of "B" or better at the beginning of a school year shall be exempt from the college rule which places a student on probation for excessive absences, and his name shall be placed on a preferred list for the current school year.

Classification of Students

For the convenience of the college administration and in keeping with custom, regular students are classified as Freshmen, Sophomores, Juniors, Seniors, Professionals, and Graduates. This classification is made only at the opening of the fall term or when a student enters for the first time. The following system of classification is used:

Freshman—Less than 45 term credits.
Sophomore—45 credits through 104 credits
Junior—105 credits through 159 credits.

Senior—160 or more credits.
Professional (School of Design)—215 or more credits.
Professional—Fifth year program in Engineering.
Graduate—A student who has already received a baccalaureate degree from a recognized college and who has been accepted in our graduate school.

This system permits students to skip classifications and graduate as soon as scholastic requirements have been satisfied.

Besides the above classification of regular students we have unclassified students, specials, and auditors in the various schools. (See "Information for applicants".)

Degrees

Since in conferring a degree and awarding a diploma, the College recognizes a student's character as well as his scholarship, the College reserves the right to withhold the degree and diploma for reasons other than unsatisfactory scholarship.

No student may be awarded more than one baccalaureate degree at any one commencement. In order to be eligible for a second baccalaureate degree, a student must complete a minimum of 36 term credits above the requirements for the first degree. There are, however, no additional residence requirements.

A candidate for the bachelor's degree who transfers from some other institution must spend at least one academic year in residence at this institution before being eligible for a degree.

An undergraduate student while not in residence may earn towards a degree not more than fifty term credits by correspondence and not more than sixty by correspondence and extension. Not more than six credit hours may be earned by correspondence towards graduation after a student's last residence at this institution. Correspondence courses cannot be taken by a resident student unless they are a part of his official schedule approved by his Dean.

After his last residence at this institution a student may earn at some other institution not more than nine term credits toward his degree requirements.

The college confers the following degrees:

1. The college confers a Bachelor's degree in the student's major field upon the undergraduate student who successfully completes in regular order any one of the prescribed curricula.
2. In certain major fields, a Professional degree is awarded for the successful completion of a fifth year of study after the completion of the requirements for a Bachelor's degree.
3. Upon the student who has previously obtained the Bachelor's degree and who successfully completes in regular order at least one year of prescribed graduate work in residence, the College confers a Master's degree in that student's major field.
4. The degree of Doctor of Philosophy, in certain specified departments, is offered in co-operation with the University at Chapel Hill under

supervision of the Graduate School of the Consolidated University of North Carolina.

5. An honorary Doctor's degree may be conferred upon candidates recommended by the various schools when approved by the General Faculty and by the Board of Trustees.

HEALTH OF STUDENTS

The authorities of the College strive to protect the health of the student in every way possible. Each student should have a COMPLETE, THOROUGH examination by his family physician before he enters college. Any abnormality should be noted, and all remedial defects corrected so that unnecessary loss of time may be prevented while he is in college. If the examination is not done, he will be given a physical examination at the College and a fee will be charged. Blanks for the physical examination are furnished by the Registrar's office.

The infirmary, maintained by the College, has accommodations for 76 patients. There is a staff of nine: the College Physician, a Supervising Nurse, a Night Supervisor, five general duty nurses, and one full-time Laboratory and X-Ray Technician.

A modernly equipped First-Aid Department, and a Laboratory and X-Ray Department are valuable features of the Infirmary.

The College Physician visits the Infirmary regularly once daily and more often when necessary. The Infirmary is never closed. A graduate nurse is on duty day and night. Students have free access to the Infirmary at all times.

Parents or guardians will be notified immediately by the Dean of Students in case of accident or serious illness of their sons, and no surgical operation will be performed, except in cases of extreme emergency, without full consent of parents.

The medical fee provides for students' infirmary service, general medical treatment, and the services of nurses. It does not provide for surgical operations, outside hospital care, or the services of dentists or any other specialist.

DEPARTMENT OF STUDENT PERSONNEL

Dr. Roy N. Anderson, Director
Mr. Lyle B. Rogers, Assistant Director
Mr. James J. Stewart, Director of Student Housing

Helping students toward maximum personal and professional development in their college experience is regarded as a fundamental obligation of the College. The Student Personnel Program is concerned with helping students undertake programs that will challenge their varying abilities, and with assisting all students to solve the academic, personal, social, and vocational problems which confront them.

Three main purposes or functions of the Department of Student Personnel may be stated:

(1) To provide a source of counseling for all students of the college, on any problems incidental to college life.

(2) To cooperate with other agencies which provide student services.

(3) To assist faculty advisers in their task of counseling students.

(4) To foster student development through the housing program.

Student Personnel Office. Advisers and others of the faculty and administrative staff may refer students to the Student Personnel Office for help wherever it seems appropriate, and students may come to the office directly. Study habits, educational and vocational plans, and personal and social problems can be explored, sources of information located, and, in some cases, the student may be referred to more specialized agencies. The Student Personnel Dept. also cooperates with other departments in organizing and operating a freshman orientation program. It is responsible for the freshman testing program.

Faculty Advisers. Every student at State College is assigned to a faculty adviser, who is to be his guide in matters of course selection, evaluation of progress, and, to some extent, at least, in any of the various problems which may confront the student in his adjustment to college life and his preparation for professional life. An adviser, both because of limited time due to teaching responsibilities and because of his background of training, cannot always provide the help needed. Therefore, the Student Personnel Office assists the adviser in working with students and provides a further resource which the student may use.

Student Housing. The Student Housing Program endeavors through organization and supervision to make the maximum contribution to the all-around development of each student. In addition to providing a suitable place for living and studying, the Program seeks to foster opportunity for personality growth. Values which a student may be expected to gain from living in a group include: a capacity to live with people of different backgrounds; intelligent use of leisure time; learning of self-direction to replace parental direction; and gains in personality development and general maturation.

The student is encouraged to participate in a dormitory organization, so that he will have an active association with his fellow students. Each dormitory is organized into a club with elected officers, and with college-appointed activities chairmen and counselors. This organization sponsors the social, athletic, and recreational programs for the occupants of the dormitory. In addition, for the dormitories housing freshmen the college appoints a selected group of upper-classmen and graduate students to serve as student counselors to assist new students in becoming oriented to college life.

THE D. H. HILL LIBRARY

Harlan Craig Brown, Director
A.B., B.S. in L.S., University of Minnesota; A.M. in L.S., University of Michigan

Mrs. Katherine Alston Edsall, Circulation Librarian
A.B., Randolph-Macon Woman's College; A.M., Columbia University; B.S. in L.S., Catholic University of America

Miss Foy Lineberry, Catalog Librarian
  A.B., Meredith College; B.S. in L.S., University of North Carolina
Miss Gloria K. Whetstone, Assistant Catalog Librarian
  A.B., Duke University; B.S. in L.S., University of North Carolina
Miss Mary Elizabeth Poole, Reference and Document Librarian
  A.B., Duke University; B.S. in L.S., University of North Carolina
Miss Anne Leach Turner, Order Librarian
  A.B., University of North Carolina; B.S. in L.S., Columbia University; A.M. in L.S., University of Michigan.
Mr. Forrest C. Palmer, Serials Librarian
  B.A., Valparaiso University; B.S. in L.S., George Peabody College
Mrs. Louella S. Posey, Assistant Serials Librarian
  A.B., University of Rochester; B.S. in L.S., Western Reserve University
Miss Mary Ellen Senter, Assistant in Circulation
  A.B., Meredith College
Mrs. Lorraine Boger, Assistant in Circulation
Mrs. Alice Ninon Crowson, Assistant in Catalog Department
Miss Melba Ellen, Assistant in Circulation
Mrs. Betty Jackson, Assistant in Circulation
Miss Miriam Johnson, Assistant in Order Department
  A.B., East Carolina Teachers' College
Mrs. Kay McKeever, Assistant in Circulation
  A.B., Flora Macdonald College
Mrs. Barbara Volk, Assistant in Serials Department
  B.S., Purdue University
Mrs. Eloise Wells, Assistant in Order Department
  B.S., University of Georgia
Mrs. Betty A. Barnes, Secretary
  B.S., Miami University, Oxford, Ohio
Mrs. Evelyn G. Culvahouse, Assistant in Circulation
  B.A., University of Tennessee
Miss Jay Hall, Assistant in Order Department
  B.A., Queen's College
Mrs. Kathryn Koonce, Assistant in Order Department

Departmental Libraries

Miss Katherine McDiarmid, Librarian, School of Textiles Library
  B.A., Goucher College; B.S. in L.S., Columbia University
Mrs. Harrye Lyons, Librarian, School of Design Library
  B.A., University of Iowa; A.M. in L.S., University of Denver.

The D. H. Hill Library building was erected in 1926, and named in honor of a former president of North Carolina State College. It houses the main part of the book collection and provides reading rooms for study and reference.

This is a reference and circulating library open to all the college personnel. There is no limit to the number of books that may be borrowed at one time. Its resources are available, through interlibrary loan, to individuals and to other educational institutions of the city and state.

The library comprises over 120,000 volumes of books and journals, and a large number of unbound items. More than 1,250 periodicals and newspapers are received currently. The library's holdings are particularly well developed in the special fields of science and technology, which are covered in the curriculum and which are followed in the research programs of the graduate school, the Agricultural Experiment Station and the Engineering Experiment Station. In addition, the library offers ample recreational facilities.

A School of Design Library, located in Daniels Hall, was established in 1941. The nucleus was a gift from the personal library of Professor Ross Shumaker and the collection now consists of more than 3,000 volumes of books, journals, bibliographical materials and reference aids.

In 1945, a department library in the School of Textiles was established. It contains over 2,000 bound volumes of books and journals and a large collection of pamphlet material.

MILITARY TRAINING AND THE ROTC

The Division of Military and Air Science—The Division of Military and Air Science headed by the Co-ordinator of Military Training and the ROTC is charged with the administration of college regulations pertaining to military training. This division is also the coordinating agency for the Army and Air Force Reserve Officers' Training Corps established at the college.

The Reserve Officers' Training Corps (ROTC) Senior Division—The Reserve Officers' Training Corps, commonly referred to by the abbreviation ROTC, is the designation of the military organization at State College. The ROTC at the college consists of both Army and Air Force units and courses. Officers of the Army and Air Force are assigned to the college as instructors in ROTC courses and non-commissioned officers of the Army and Air Force are assigned as Assistant Instructors and Administrative Personnel. The senior Army officer and the senior Air Force officer assigned to the college are designated as Professor of Military Science and Tactics (PMST) and Professor of Air Science and Tactics (PAST) respectively. These officers direct the instruction of their respective units under programs of instruction prepared by the Department of the Army for Army ROTC units and by the Department of the Air Force for Air Force ROTC courses. Army officer instructors are designated as Assistant Professors of Military Science and Tactics and Air Force officer instructors are designated as Assistant Professors of Air Science and Tactics.

The mission of the Army ROTC, as defined by the Department of the Army, is to produce junior officers who have the qualities and attributes essential to their progressive and continued development as officers of the Army of the United States.

The mission of the Air Force ROTC, as defined by the Department of the Air Force, is to select and prepare students, through a permanent program of instruction at civilian educational institutions, to serve as officers in the Regular and Reserve components of the United States Air Force and to assist in discharging, where necessary, any institutional obligations to offer instruction in military training.

Courses of Instruction—Army ROTC courses of instruction and training are conducted by the Department of Military Science and Tactics under direction of the Professor of Military Science and Tactics.

Air Force ROTC courses of instruction and training are conducted by the Department of Air Science and Tactics under direction of the Professor of Air Science and Tactics.

Programs of instruction for both Army and Air Force ROTC consist of a two-year basic course and a two-year advanced course. The basic course in either the Army or Air Force ROTC is required for all physically fit male freshmen and sophomores unless excused by the college administration.* Enrollment in advanced courses is elective on the part of the student. The selection of advanced course students is made from applicants who are physically qualified and who have above average academic and military records. Veterans, less than 27 years of age, who have had one year or more of service in the armed forces are eligible for enrollment in advanced courses of Army or Air Force upon reaching their sophomore year provided they are in good academic standing.

A detailed description of courses is given under each of the departments in Section IV of the catalog.

Applications for Advanced Course Enrollment—The number of students enrolled in the advanced courses of Army and Air Force ROTC is limited by quotas assigned the college by the Department of the Army and Department of the Air Force respectively. Applications from qualified students for advanced course enrollment in either Army or Air Force ROTC are called for before the end of the term next preceding the one in which students become eligible for enrollment. Students who are selected for enrollment subject to physical qualifications are required to undergo a physical examination at their own expense prior to registration. Failure to meet physical qualifications on the part of any student is cause for final disapproval of his application.

Uniforms and Equipment—An officer's type Army uniform for both basic and advanced course students enrolled in Army ROTC is provided by the Federal Government. Students enrolled in the basic course Air Force ROTC are provided an Air Force type uniform by the Federal Government. Students enrolled in advanced courses Air Force ROTC are furnished a monetary allowance by the Federal Government for the purchase of uniforms which become the property of the students upon completion of the course. Army and Air Force equipment for instruction of students is provided by the Federal Government. Uniforms and equipment provided by the Government are issued to the college which is accountable for their care and use.

Credit—Credit is allowed for work at other institutions having an ROTC Unit established in accordance with the provisions of the National Defense

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* All veterans in service as long as six months are excused from this requirement.

Act and regulations governing the ROTC. Record of a student's prior training in the ROTC is obtained from the institution concerned.

Training Value of the ROTC—ROTC courses include instruction in Leadership, Personnel Management, Exercise of Command, Tactical Employment of the Combined Arms and Military Policies and Problems of the United States. The courses not only prepare students to be officers in the Army of the U. S. and U. S. Air Force but awakens in them an appreciation of the obligations of citizenship, and secures for them personal benefits resulting from practical application of organization and responsible leadership.

Financial Aid—Students enrolled in the advanced course are paid a monetary allowance in lieu of subsistence at the daily rate equal to the value of the commuted ration ($.90) for a total period not to exceed 595 days during the two years of the course. Students in the basic course receive no monetary allowance.

Organization of the ROTC—The College ROTC consists of an Army regiment, an Air Force wing, a Band, and a Drum and Bugle Corps. The Army regiment, commanded by a Cadet Colonel and staff, consists of two battalions. The Air Force wing, commanded by a Cadet Colonel and staff, consists of two groups. The cadet colonels and their staffs, cadet battalion and group commanders and their staffs, and the company and squadron commanders are selected from students enrolled in second year advanced courses. Platoon and flight commanders are selected from students enrolled in advanced courses. Second year basic students are selected as non-commissioned officers. Cadet officers and cadet non-commissioned officers conduct drill field instruction under supervision of officers and non-commissioned officers of the Army and Air Force assigned to the college.

Distinguished Military Students—Each year the college is authorized to designate outstanding students of the ROTC as Distinguished Military Students. Those so designated may, upon graduation from college, be designated Distinguished Military Graduates and may be selected for Commissions in the regular Army provided they wish to avail themselves of this opportunity. Distinguished Military Graduates are not selected for commission in the Regular Air Force, but may apply for a regular commission after serving on active duty for one year.

Selective Service in Relation to the ROTC—Enrollment in the ROTC does not in itself defer a student from induction and service under the Universal Military Training and Service Act. The law provides that "within such numbers as may be prescribed by the Secretary of Defense, any person who (A) has been or may hereafter be selected for enrollment or continuance in the senior division, Reserve Officers' Training Corps, or the Air Reserve Officers' Training Corps, or the Naval Reserve Officers' Training Corps; (B) agrees, in writing, to accept a commission, if tendered, and to serve, subject to order of the Secretary of the Military Department having jurisdiction over him, not less than two years on active duty after receipt of a commission; and (C) agrees to remain a member of a regular or reserve component until the eighth anniversary of the receipt of a commission in accordance with his obligation under subsection (d) of section 4 of this title, shall be deferred from induction under this title until after completion or termination of the course of instruction and so long as he continues in a regular or reserve status upon being commissioned, but shall not be exempt from registration."

Under the above section of the law, deferment quotas are assigned the college and within these quota limitations ROTC students are selected for deferment by a board consisting of academic and military faculty members. Selection is based on the student's military and academic records. Students selected for deferment and who accept deferment must sign the written agreement referred to in the above quoted section of the law which defers them from induction and service as stipulated. Failure to remain in good standing in military or academic courses will be cause for withdrawal of deferment.

PHYSICAL EDUCATION AND INTRAMURAL ATHLETICS

Professor Paul H. Derr, Head

Professor J. F. Miller
Assistant Professor C. G. Doak
Assistant Professor W. E. Smith
Instructor John Kenfield
Instructor J. B. Edwards, Jr.
Instructor Gaylor E. Hooks
Instructor Harold Keating
Assistant Professor E. R. DeGroat
Secretary Miss Louise Raby
Custodian Harold H. Haynes

Aims.—In general, the Department aims: (a) to develop and maintain maximum physical efficiency as a counterbalance for the heavy academic load being carried by our students; (b) to develop useful skills in sports; (c) to teach students to conduct themselves in socially acceptable ways; (d) to promote activities which will not only be beneficial for the participant while he is in school, but will be equally adaptable for meeting his needs in later life.

Control: All activities of the Department are controlled through the College, and under the supervision of the Dean of the School of General Studies. The Head of the Department is responsible for organizing and directing the program with the assistance of the staff.

Buildings and Grounds: The Department of Physical Education and Intramural Athletics is quartered in the Frank Thompson Gymnasium. Enclosed in the gymnasium is a swimming pool, a large basketball playing area, an auxiliary gym with three one wall handball courts, a room for wrestling, a locker room and showers. Doak Field adjacent to the Gymnasium is used for physical education classes and intramural activities. There is also a football and track field available for physical education classes. Alexander Field is used for intramurals and recreational play. The College has eleven hard surface tennis courts, with additional courts contemplated.

Physical Education Activities: The College requires all students to enroll in some type of physical activity for two years, or six full terms. The classes meet twice a week, one credit being given for each term's work. The College also requires that all students must meet a minimum swimming standard, as well as one quarter (meeting once a week) of Personal Hygiene during the freshman year.

The Physical Education fee, collected from all students at registration, permits the Department to offer many special services to State College students. Complete uniforms (except for shoes) are issued free; laundry service for uniforms is provided; clean towels and soap are issued whenever requested; equipment for student use is provided both during and outside regular class hours.

Class periods are primarily used for instructional purposes; a performance as well as a written examination is required of each student.

Intramural Activities: Activities are fostered and prompted in many lines of athletic sports for the student body. Meets, tournaments, and leagues are seasonably organized in twelve separate sports. Participation in these sports activities is purely voluntary; it does not receive college credit. Sports used in this program are correlated with those used in the required class work in Physical Education. Instruction in the sports is given in the class work, and opportunity for competition is provided in the intramural program. Cups, shields, and trophies are awarded winners in these competitions.

An Intramural Advisory Board comprised of representative students is organized to assist the Director.

STUDENT ACTIVITIES

Campus Government and Honor System

Upon matriculation at the North Carolina State College the student becomes a member of the community and fellowship that is State College. As a member of this great fellowship and as a citizen of the campus community, each and every student is responsible, in both the legal and moral sense, for the effective ordering of his personal life in the interest of the common good.

The new Constitution and By-Laws establishing the Campus Government and Honor System of the North Carolina State College were adopted in May 1945, after a year of intensive work and study by a joint student and faculty committee.

The Campus Government and Honor System of the North Carolina State College was conceived in creative cooperation and is dedicated to the full and free assumption of joint responsibility by the student body and the faculty for the furtherance of the present and future effectiveness of State College. Four faculty members hold elective seats on the Campus Government Council along with twenty-nine students. This body has full legislative, executive and judicial authority within the framework of the Campus Government Constitution and the legal entity that is the North Carolina State College of Agriculture and Engineering of the University of North Carolina.

Since practical experience with government and democratic living is an indispensable supplementation of academic training, the Campus Government and Honor System of the North Carolina State College is a capstone extra-curricular activity that offers every student challenging opportunity for personal development and worthwhile service to the college.

Student Publications

The Publications Board is composed of the editors and business managers of all student publications, the president and the past president of the junior class, the president of the Student Council, and five faculty members. The Board seeks to promote the interests of the College and of the publications, to insure cooperation among the publications, and to hold the loyal support of the faculty, the students, and the public.

The Technician, the student newspaper, is delivered to each student's mail box every Friday morning of the regular College session. The charge for the paper is included in the student's publications fee.

The Agromeck is the official annual published at the end of each scholastic year of the College. A copy of The Agromeck is also paid for by each student in his publications fee.

The Tower, formerly the State College Handbook, is published annually under the direction of the Board of Student Publications and is supported by publication fees. The student Radio Station WVWP is a member of the Board of Student Publications and supported by the publication fees.

The Agriculturist, a monthly magazine in its field, was begun by the activities of the Alpha Zeta fraternity and the "Ag" Club. All students of the School of Agriculture and Forestry are concerned in this enterprise.

The Southern Engineer, the organ of the School of Engineering, is managed by the Board of Directors of the Southern Engineer. The Publication of this magazine is financed by the student engineering fee.

Pi-ne-tum is the annual of the School of Forestry. Its contents constitute a record of persons, especially the graduating class, and of events of the year interesting to students of the School and their friends.

The Textile Forum is published quarterly by the students in the Textile School.

The Student Publications of the School of Design is a magazine published each quarter by the students in the School of Design.

Clubs and Societies

All clubs and societies endeavor to bring together students (some clubs include members of the faculty), with the same interests or professional objective, in order to cultivate close personal relations and fellowship. Their chief purpose is to inculcate high professional consciousness and *esprit de corps.* With a view toward the accomplishment of these ends, they afford to members an opportunity to hear and to participate in discussions of professional problems, to prepare and to present papers on current technical topics.

School of Agriculture:

The Agricultural Club, besides the usual activities, sponsors an annual Ag Fair, Livestock Day, picnic, and dance.

Agricultural Economics Club
Agronomy Society
Alpha Kappa Delta (Honorary—Sociology)

Alpha Zeta (Honorary)
American Farm Economics Assoc.
American Society of Agricultural Engineers
Animal Industry Club
Floriculture Society
Horticulture Club
Poultry Science Club
4-H Supper Club

School of Design:

American Institute of Architects—N. C. State College Student Section.

School of Education:

The Collegiate Chapter of the Future Farmers of America devotes its attention to matters of interest to students who are preparing to become teachers of agriculture.

Epsilon Pi Tau (Honorary Industrial Arts Education)
Industrial Arts Club
Industrial Recreation Club
Kappa Phi Kappa (Honorary—Teaching)

School of Engineering:

The Engineers' Council, composed of three students and a professor from each Department of the School of Engineering, publishes quarterly *The Southern Engineer.*

American Ceramic Society
American Institute of Chemical Engineers
American Institute of Electrical Engineers
American Institute of Mining and Metallurgical Engineers
American Society of Civil Engineers
American Society of Heating and Ventilating Engineers
American Society of Mechanical Engineers
Chi Epsilon (C. E. Honorary)
Eta Kappa Nu (E. E. Honorary)
Gamma Sigma Epsilon (Chemical Honorary)
Institute of Aeronautical Sciences
Institute of Radio Engineers
Keramos (Honorary—Ceramics)
Physics Club
Pi Tau Sigma (M. E. Honorary)
Rockhound Society (Geology)
Society for Advancement of Management
Society for Industrial Engineers
Tau Beta Pi (Honorary)
Theta Tau
Alpha Pi Mu (Honorary Industrial Engineering)

School of Forestry:

Forestry Club
Xi Sigma Pi (Honorary—Forestry)

School of Textiles:

The Tompkins Textile Society endeavors to keep abreast of whatever affects the textile industry, state, national, or foreign.

American Association of Textile Chemists and Colorists
Delta Kappa Phi
Kappa Sigma Phi Sorority
Phi Psi (Honorary)
Sigma Tau Sigma (Honorary)

Other Campus Organizations

Alpha Phi Omega (Boy Scouts)
American Association of University Professors
Aquinas Club (Catholic)
Arnold Society of Air Cadets
Baptist Student Union
Blue Key (Honorary: Scholarship, Leadership, Student Activities)
Cadet Officers Association
Canterbury Club (Episcopal)
Charlotte Club
Coed Club
College Union
Cosmopolitan Club
Glee Club
Golden Chain: Senior Citizenship
Hillel (Jewish)
Industrial Arts Club
Interdormitory Council
Interfraternity Council
Leopold Wildlife Society
Lutheran Students Association
Monogram Club
Outing Club
Mu Beta Psi (Honorary—Musical)
Phi Eta Sigma (Honorary—Freshman)
Phi Kappa Phi (Honorary—Scholarship)
Physics Club
Pi Kappa Delta (Public Speaking)
Scabbard and Blade (Honorary—Military)
Sigma Pi Alpha (Honorary—Language)
Thirty and Three (Honorary)
Wesley Foundation (Methodist)
Westminster Fellowship (Presbyterian)

Dormitory Clubs

The following Dormitory Clubs are active at State College and every student living in these dormitories is a member and is urged to participate:

Alexander Club
Bagwell Club
Becton Club
Berry Club
Fourth Club
Gold Club
Owen Club
Syme Club
Tucker Club
Turlington Club
Welch Club

The Inter-Dormitory Council is composed of the Dormitory Presidents and one other representative from each Club. The purpose of the Council is to provide an opportunity for a well-rounded life for every student living in a dormitory.

Social Fraternities

Following are the national Greek-Letter Fraternities having chapters at State College.

Alpha Gamma Rho
Delta Sigma Phi
Kappa Alpha
Kappa Sigma

Lambda Chi Alpha
Phi Kappa Tau
Phi Epsilon Pi
Pi Kappa Alpha
Pi Kappa Phi
Sigma Alpha Epsilon
Sigma Alpha Mu
Sigma Chi
Sigma Nu
Sigma Phi Epsilon
Sigma Pi
Tau Kappa Epsilon
Theta Chi
Farm House

The Interfraternity Council, composed of two representatives from each chapter, has as its purposes to advance the interests of North Carolina State College; to promote the general interests and welfare of the associated fraternities as a body; and to insure cooperation between them in their relations with the faculty, the student body, and the public in general.

MEDALS AND PRIZES

1. The Alpha Zeta Cup is awarded to the sophomore in Agriculture who during his freshman year made the highest scholastic average.

2. The General Alumni Association of the College presents annually a trophy to the student who during the College year has most distinguished himself in athletics.

3. The American Institute of Chemical Engineers presents annually its award to the sophomore who during his freshman year made the highest scholastic record.

4. The Associated General Contractors of America Prize is awarded each year by the Carolina Branch of this organization to the member of the graduating class in Construction Engineering who during his sophomore, junior, and senior years has made the highest scholastic record.

5. The Moyland-Drysdale Corporation Scholarship Cup, presented by Mr. George N. Moyland, of Hendersonville, North Carolina, President of the Corporation, is awarded annually to the freshman in Ceramic Engineering who, during the two terms preceding Scholarship Day, has the highest scholastic record together with interest shown in the activities of the Department.

6. The J. C. Steele Scholarship Cup, presented by J. C. Steele and Sons, of Statesville, North Carolina, to commemorate the establishment by Mr. Steele of the first plant for the manufacture in the South of ceramic machinery, is awarded annually to the student of the three upper classes in the Department of Ceramic Engineering who has made during the three terms preceding Scholarship Day the highest scholastic record. In making the award, personality and interest in the activities of the Department are considered.

7. The Sigma Tau Sigma Cup is awarded annually to the senior in Textiles who has the highest scholastic record.

8. The National Association of Textile Manufacturers Medal is awarded annually to a senior in the State College Textile School. The award is based upon conditions outlined by the National Association.

9. Phi Kappa Phi, Honorary Scholarship Society, awards each year a gold medal to the senior who as a junior, a silver medal to the junior who as a

sophomore, and a bronze medal to the sophomore who as a freshman, made respectively, the highest scholastic record.

10. The Agronomy Scholarship Plaque is awarded to the senior with the highest scholastic average in Agronomy.

11. The Agronomy Plaque is awarded to the most outstanding Agronomy Senior.

12. The Sigma Pi Alpha Certificate of Merit is awarded to a junior or senior, usually a senior, upon the basis of high language average, number of languages studied, high academic average, and interest in languages.

13. The Kappa Phi Kappa Certificate and Medal is awarded to the graduating senior who attains the highest scholastic average, and who was most outstanding in leadership activities during his residence at N. C. State College.

14. The Eta Kappa Nu Award—Electrical Engineering Handbook—is awarded to the sophomore having the best combination of scholarship and ability to get along with others.

15. The Pi Tau Sigma Award—Marks Handbook—is awarded to the Mechanical Engineering sophomore with the highest average. (Does not include transfer students.)

16. The Tau Beta Pi Cup is awarded to the senior engineer having the highest scholastic average through the sophomore year.

17. The American Society of Mechanical Engineers Certificate is awarded for outstanding effort and accomplishment in the Mechanical Engineering Department during the period of a year.

18. The School of Engineering Award—Gold Watch—is awarded to the most outstanding senior in the School of Engineering.

19. The Phi Psi Certificate and Embossed Wallet is awarded to a senior in Textiles on the basis of scholarship, initiative, personality, loyalty to work, and courtesy.

20. The American Association of Textile Chemists and Colorists Certificate is awarded to the senior in the Department of Textile Chemistry and Dyeing on the basis of outstanding scholarship and proficiency.

21. The Gamma Sigma Epsilon Cup is awarded to the senior making the best record in Chemistry. (Engineering, Agriculture, or Textiles.)

22. American Institute of Architects—Gold Medal—is awarded annually to the graduate in architecture whose all-round achievement in character and scholarship has been the most outstanding. A book award is given to the runner-up.

23. The North Carolina Chapter of The American Institute of Architects—Book Award—is given annually to the student in architecture whose work in design has been the most outstanding.

INTERCOLLEGIATE ATHLETICS

R. B. Clogston, Director
W. R. Casey, Assistant

Horace Hendrickson, Football Coach
Everett Case, Basketball Coach

Carl Anderson, Assistant Basketball Coach
Victor Sorrell, Baseball Coach
Willis Casey, Swimming Coach
Graham Campell, Ticket Manager
John Kenfield, Tennis Coach
Victor Bubas, Assistant Basketball Coach
Mere McIntosh, Trainer
R. E. Hiller, Jr., Fencing Coach
Roy B. Clogston, Golf Coach
Mike Karmazan, Line Coach
C. A. Temerario, First Assistant Football Coach
William K. Hickman, Backfield Coach
Beattie Feathers, Assistant Football Coach & Assistant Baseball Coach
Al Crawford, Wrestling Coach
Thomas Fitzgibbon, Track Coach & Assistant Trainer
Harold Keating, Assistant Trainer
Eric DeGroat, Soccer Coach
John Abbott, Custodian Athletic Supplies
Anne Perkins Lojko, Secretary Athletic Department
Ed Storey, Athletic Publicity Director
Richard Farrell, Bookkeeper

North Carolina State College is a member of the Southern Conference and subscribes to its rules of eligibility for all intercollegiate contests. The program consists of the organization and training of representative teams in the following sports: football, basketball, baseball, track, cross-country, wrestling, swimming, tennis, golf, soccer, fencing, and rifle competition.

Intercollegiate Athletics is a separate department of the college. Its policies are determined by the Athletic Council, and carried out under the supervision of the Director of Athletics. All activities of the Department are controlled by the College.

YOUNG MEN'S CHRISTIAN ASSOCIATION

Board of Directors

M. E. GARDNER, *Chairman*

E. L. Cloyd
David C. Worth
L. L. Vaughan
John A. Park
T. C. Brown
J. M. Clarkson

F. B. Wheeler
A. D. Stuart
B. F. Brown
Ralph W. Cummings
W. N. Hicks
Thomas Nelson

Employed Staff

EDWARD S. KING, General Secretary
N. B. WATTS, Associate Secretary
E. W. ROGERS, Assistant Secretary
MRS. L. W. BISHOP, Office Secretary

Student Organization

The Student Cabinet

The cabinet is composed of the four officers of the association, President, Vice-President, Secretary, and Treasurer and the chairmen of all standing committees. The officers are elected annually by ballot. The committee chairmen are appointed by the President. The cabinet is in charge of the program of the association. The four elected officers are ex-officio members of the Board of Directors.

The objective of the Young Men's Christian Association is to help contribute whatever is lacking in the total educational situation to make the principles and the spirit of the Christian religion effective in personal life and in all social relations.

The Y. M. C. A. Building is the social and religious center of the campus. On the basement floor is a recreation room, a guest room, and the Student Supply Store. There is a spacious lobby, an auditorium, a reception room, office of the assistant secretary, and the service office on the first floor. The second floor provides space for a Conference Room, a Committee Room, the Y.M.C.A. Cabinet Room, and the offices of the Associate Secretary and the General Secretary.

The student-employment service is directed by the Associate Secretary of the Association.

Student and faculty organizations of all kinds use the facilities of the building for meetings and social gatherings, entertainments and lectures.

The Y. M. C. A. program, directed by the Student Cabinet, includes, with other features not mentioned, work for new students; organizing a Freshman Cabinet; planning socials with the students from nearby women's colleges; bringing to the campus eminent men to speak on such topics as men-and-women relations, and present-day international, racial, and economic questions; conducting an annual religious-emphasis week under the leadership of Christian ministers or laymen who understand student life; sending delegates to State, Regional, and National Christian Student Conferences.

During the collegiate year 1947-1948 a Y.M.C.A. Building was erected in Vetville to serve the five hundred married students and their families living in the two housing areas for married veterans—West Haven and Vetville. This is known as the West Campus Branch of N. C. State College Y.M.C.A. The building provides facilities for Sunday School, church services, Arts and Crafts classes, and for dances, parties, movies, town meetings and social gatherings. It also provides space for a grocery store.

MUSIC

Christian D. Kutschinski, Director

Students with previous musical experience are encouraged to continue such activities in campus musical organizations for which they can qualify and should enroll for their chosen activities on the day of registration. Freshmen and sophomores may enroll in the R. O. T. C. Band for their required military drill when accepted on the basis of auditions and requirements of sectional balance.

The 80-piece R. O. T. C. Band and 50-piece Drum-and-Bugle Corps furnish martial music for all military parades by the R. O. T. C. Regiment. Their R. O. T. C. drill periods are devoted to both military and musical instruction.

The 90-piece Red-Coat Band plays and marches at football games, and at other campus and civic affairs. Its membership comprises select R. O. T. C. and non-R. O. T. C. bandsmen, who rehearse three hours a week independently of the R. O. T. C. Band.

After the football season it becomes the Concert Band. Credit is offered for the third and fourth years of participation.

The band is also subdivided into voluntary smaller units which alternate in furnishing music at pep meetings, basketball games, and on other such occasions.

The Concert Band, composed of 72 of the most proficient musicians on the campus, concentrates on the study and performance of the finest in concert music. Its activities have greatly increased the cultural growth of those participating, and have done much toward increasing appreciation of music on the campus and in the community, in addition to providing wholesome entertainment.

The R.O.T.C. Drum-and-Bugle Corps, besides functioning as a separate unit, is also combined with the band on certain occasions, and performs at some of the football games.

The Concert Orchestra is augmented by a number of Raleigh musicians to round out a symphonic instrumentation. Besides preparing concert programs, the orchestra is divided into smaller units to provide music of a lighter nature for numerous College functions.

The Men's Glee Club rehearses three times a week, and alternates with the orchestra and bands in giving concerts throughout the year. It has proved to be a very popular extracurricular activity, and the group is in demand for broadcasts, and for concerts out of town and at civic functions, in addition to those on the campus.

A Male Quartet and small Chamber Music ensembles are encouraged.

COLLEGE PUBLICATIONS

The State College Record is the official publication of State College and is issued from time to time, giving results of special studies and of research by members of the college faculty. The March issue is the annual CATALOG with announcements for the following year. Announcements as to College Extension courses also are included in *The Record* series as is found necessary.

In addition, the College Extension Division issues brief notices of short courses and special conferences which are held on the campus from time to time during the college year. The Director of Foundations likewise issues brief brochures which are of interest to citizens of the State.

Technical and popular bulletins are issued by the Agricultural Experiment Station as research projects are completed or as they have progressed far enough to be of definite value. *Research and Farming* also is a quarterly publication of the Experiment Station. Both the bulletins of the Station and the quarterly publication will be sent free to citizens of the State on request.

General publications, interpreting the scientific findings of the Experiment Station or giving results of Extension demonstration, are compiled by members of the Agricultural Extension Staff and are printed as circulars, folders and pamphlets. Usually they are brief, written in simple style and designed for popular use. *The Extension Farm-News*, published monthly, is the official house organ of the Extension Service. All of these publications also are available free to citizens of the State on request.

Results of experimental and research projects in the School of Engineering are disseminated by means of Engineering School Bulletins published by the Department of Engineering Research. This department also issues a quarterly publication, Engineering Research News, which is a review of current activities in the School of Engineering. Copies of these publications may be obtained by writing to the Department of Engineering Research.

Copies of publications relating to research in Textiles may be obtained from the Dean of the School of Textiles.

THE GENERAL ALUMNI ASSOCIATION

H. W. Taylor, Director of Alumni Affairs

Purpose.—The purposes of this organization are: to promote the growth, progress, and general welfare of State College; to foster among its former students a sentiment of regard for one another and continuing attachment to their Alma Mater; and, to interest prospective students in attending State College.

Membership.—Active membership is available to all former students, regardless of length of stay at the college; members of the faculty, administrative staff, Agricultural Extension Service, Agricultural Experiment Station, Teachers of Agriculture in North Carolina High Schools; and other persons who have successfully completed a short course at North Carolina State College and received a certificate therefor.

Honorary membership shall consist of such distinguished persons as are duly elected to honorary membership in the Association.

Meetings.—The Association meets annually during Alumni Week.

Reunions.—Class reunions are held each year in connection with Alumni Week. They are scheduled so that each class has a reunion every five years after graduation.

Elections.—Officers of the association are elected by the active members each year through the medium of a mail ballot.

State College Clubs.—Local clubs are organized in most of the counties in North Carolina and in a number of cities in other states.

State College News.—State College News is published every month in the year by the General Alumni Association and is sent to all dues paying members. The purpose of this magazine is to keep Association members in touch with the college and with each other. It carries news about former and present students and about the college, and is well illustrated with pictures.

The Alumni Office.—Records of both graduates and nongraduates are kept by the Alumni Office. The master file includes information on all former students; other files are arranged geographically and by classes. Biographical files are also kept.

Serving as a medium of communication between alumni and the College, the Alumni Offices, located in the Old Infirmary Building, are official headquarters for alumni when they visit the campus.

COLLEGE FOUNDATIONS

There are seven foundations organized and incorporated under the laws of North Carolina which promote and support various programs of State College.

THE NORTH CAROLINA STATE COLLEGE FOUNDATION, INC., was organized December 11, 1942 to foster and promote the general welfare of North Carolina State College and to receive and administer gifts and donations for such purposes. The Board of Directors is composed of Alumni of State College and members of the Board of Trustees of the University of North Carolina.

Among the projects that the State College Foundation has helped to sponsor are the completion of the Memorial Tower according to the original plan and the installation of Carillonic bells, manufacture and sale of State College plates, the construction of dormitories Owen and Tucker made possible by a long-term lease from the State of North Carolina and a private loan of $1,100,000 to the Foundation.

THE AGRICULTURAL FOUNDATION, INC., renders financial assistance through salary supplements in the development of strong teaching programs in agriculture; assists the Extension Division and Agricultural Experiment Station of the School of Agriculture at North Carolina State College in obtaining competent scientists for the research programs in forestry, agricultural engineering, poultry, animal husbandry and nutrition, crops and soils, disease and insect control, marketing and the economics of farming and rural living.

Special Agricultural Funds

1. R. J. Reynolds Fund—During the period 1938-1947, Mr. Richard J. Reynolds, formerly of Winston-Salem, contributed $5,000 annually to the School of Agriculture for the purpose of supplementing the salaries of four or five top ranking scientists on the agricultural staff. The fund enabled the College to keep in North Carolina a few leaders in the science of agricultural research. Early in 1948, Mr. Reynolds transferred income-producing securities sufficient to bear an annual income of $5,000.

2. **The Poultry and Animal Nutrition Fund.** The feed manufacturers of North Carolina have set up a special fund ear-marked for use in poultry and animal nutrition.
3. **The North Carolina Farm Bureau** has set up a separate educational endowment for use in supplementing State funds for teaching, research, and extension work in Plant Pathology.
4. **The North Carolina Beef Cattle Breeders** have set up an endowed program to promote all phases of beef cattle work in North Carolina.
5. **The Forestry Fund.** A separate fund in The Agricultural Foundation, ear-marked for use in forestry, has been established by several individuals and corporations interested in this program.
6. **"The Manly G. Mann Endowed Professorship in Agricultural Economics"** has been set up by the Farmers Cooperative Exchange.
7. **"The E. G. Moss Fellowship in Tobacco Research"** is sponsored by the North Carolina State Grange to provide the incentive and opportunity for outstanding students to continue advanced training and research in the field of tobacco production.
8. The **Horticultural Fund** has been established by the N. C. Association of Nurserymen, N. C. State Florists Association, and others interested in these fields.
9. **The William Neal Reynolds Fund.** In 1950 the late William Neal Reynolds gave ten thousand shares of Reynolds stock to establish ten Distinguished Professors of Agriculture. The income from these securities represents approximately $20,000 annually to be used for this purpose.
10. **The Nickels for Know-How Program in North Carolina.** In November, 1951 the farmers of North Carolina voted an assessment of five cents per ton on feed and fertilizer to be used through the Agricultural Foundation in expanding research and the dissemination of research findings in North Carolina. The funds are collected through the manufacturers by the State Department of Agriculture and should raise approximately $125,000 annually.

THE NORTH CAROLINA DAIRY FOUNDATION, INC., aims to promote and improve all phases of dairying in North Carolina through education, research, and extension. A Board of Directors of sixty persons handle the affairs of the Foundation, and these directors represent distributors, producers and jobbers.

Special Dairy Foundation Funds

1. **"The Guilford Dairy Professorship of Dairy Production"** has been established by the Guilford Dairy Cooperative Association of Greensboro.
2. **"The Tarheel Supplymen's Professorship in Dairying"** has been set up by the members of the Tarheel Supplymen's Association.
3. **"The George S. Coble Endowed Professorship in Animal Disease Research"** has been established by the Coble Dairy Products, Inc., of Lexington.
4. **"The Farmers Cooperative Dairy Fellowship in Dairy Husbandry"** has been established by the Farmers Cooperative Dairy of Winston-Salem.

5. "The W. L. Clevenger Research Fellowship in Dairy Manufacturing" has been established by the dairy products manufacturers.

THE NORTH CAROLINA ENGINEERING FOUNDATION, INC., objectives are to give financial assistance to teaching, research, and extension in engineering and industry. The Engineering Foundation works closely with large and small corporations and individuals whose business is closely allied with that of engineers and contractors.

Special Engineering Foundation Funds

1. "The Frank Page Endowed Professorship of Civil Engineering" has been endowed by members of the Carolina Road Builders Association to honor the name of the late Mr. Frank Page, first Director of the North Carolina Highway Commission.
2. "The L. L. Vaughan Professorship of Mechanical Engineering" is sponsored by the North Carolina Association of Plumbing and Heating Contractors and named to honor Professor L. L. Vaughan, of State College, now Professor Emeritus of Mechanical Engineering.
3. "The Walter Clark Professorship of Industrial Engineering" has been endowed by the family of the late Chief Justice Walter Clark of North Carolina, namely, Mrs. J. E. Erwin, David Clark, William A. Graham Clark, John W. Clark, Thorne Clark, Mrs. John Allan MacLean, and Mrs. Walter Clark, Jr.
4. "The Chemical Engineering Fund" has been established by contributions from individuals and corporations connected with the pulp and paper industry of North Carolina for the purpose of supplementing State salary schedules in this department.
5. The Construction and Engineering Educational Fund is supported by the general contractors for the purpose of promoting the construction program in the School of Engineering at N. C. State College.
6. "The Electrical Industries Fund" is a fund supported by the North Carolina Electrical Contractors, the Electrical Supply Companies and Motor Winding and Repair Shops.
7. The Furniture Foundation Fund has been set up by the Furniture Foundation, Inc., a corporation made up of southeastern furniture manufacturers. This fund is used in promoting the teaching and research programs in furniture manufacturing and management.
8. Roofing and Sheet Metal Contractors Fund is supported by the Carolinas Roofing and Sheet Metal Contractors and will be used to establish a Professorship in the School of Engineering.
9. Ceramic Industries Fund is now being supported by Brick & Tile, Inc., and other structural clay products manufacturers for teaching and research in Ceramic Engineering.
10. Other organized groups contributing to programs in the Engineering Foundations are:
    a. Iron and steel industries
    b. Professional engineers

c. Industrial suppliers and equipment distributors
d. Lumber and building supply dealers
e. Painting and decorating contractors
f. Ready-mixed concrete producers
g. Tile, marble and terrazzo industry
h. Concrete products manufacturers

THE NORTH CAROLINA TEXTILE FOUNDATION, INC., was formed to promote the development of the School of Textiles. It was incorporated on December 31, 1942, and funds for this Foundation have been raised largely from textile manufacturing plants and other corporations and industries closely allied to textiles. This Foundation has had remarkable success, and its assets are now in excess of a million dollars. As a result of the work of this Foundation, the School of Textiles at North Carolina State College is considered by many as the most outstanding Textile School in the world.

Special Textile Foundation Funds

1. **"The Burlington Mills Professorship of Textiles."** Burlington Mills, Inc., of Greensboro, has contributed shares of its common stock, with a market value of approximately $70,000, to the North Carolina Textile Foundation as an endowment for the creation of a teaching and research professorship.
2. **"The Benjamin B. Gossett Lectures on Textiles."** The Benjamin B. Gossett lectures on textiles were made possible by a gift of $10,000 in 1946 by Doctor Benjamin B. Gossett, a leading textile manufacturer of Charlotte, North Carolina. Each year during the next few years the leading textile executives, economists, and scientists of America will be brought to the College in the Gossett Lectures series.
3. **"The Chester H. Roth Professorship of Knitting,"** endowed by Mr. Roth, of New York City.
4. **"The A. C. Lineberger Professorship of Yarn Manufacturing,"** endowed by The Lineberger Foundation of Belmont, North Carolina.
5. **"The Edgar and Emily Hesslein Professorship of Textiles,"** endowed by The Edgar and Emily Hesslein Foundation of New York City.
6. **The Stuart W. Cramer Fund,** set up by George Cramer and Stuart W. Cramer, Jr. in memory of their father, for a faculty-student center in the new Textile Building.
7. **The Burlington Mills Library Fund** ear-marked for enlargement of the textile library in the new Textile Building.
8. **The W. J. Carter Special Fund** contributed to equip a student lounge.

THE NORTH CAROLINA ARCHITECTURAL FOUNDATION, INC. was organized in January, 1949. Mr. Anthony Lord, of Asheville, is president; and the Foundation has twenty-five representative North Carolina architects on its Board of Directors. Foundation funds are used for the promotion and advancement of architectural education at North Carolina State College of the University of North Carolina.

THE NORTH CAROLINA FORESTRY FOUNDATION was incorporated April 15, 1929, to aid and promote, by financial assistance and otherwise, all types of forestry education and research at, or by, the School of Forestry of North Carolina State College of the University of North Carolina.

The North Carolina Forestry Foundation has acquired a tract of land known as the Hofmann Forest and consisting of about 80,000 acres in Jones and Onslow Counties which is used as a demonstration and research laboratory for forestry students. The Foundation has set aside and aided in developing an area for the Junior Camp on the Hofmann Forest; it has also aided in developing the Sophomore Camp on the Hill Forest and in operating and developing the areas known as the Hill Forest, Hope Valley Forest, and Richland Creek Farm Forest.

III. SCHOOLS AND DEPARTMENTS

SCHOOL OF GENERAL STUDIES

John W. Shirley, Dean
Benjamin Franklin Brown, Dean Emeritus*

When it became the Land-Grant College of North Carolina, State College inherited a long tradition of education, calling for furnishing maximum service to all the citizens of the state. Its programs from the first, therefore, embraced the finest technical training based on the most thorough research, coupled with the humane and social studies necessary in developing individuals of highest character and civic responsibility. From the beginning, State College, like other Land-Grant colleges, has taken as its goal this two-fold function: training men of professional and technical leadership who are at the same time men of social leadership, whole men able to live as enlightened, free citizens in our democratic state.

With the Consolidation of State College into the University of North Carolina in 1935, this double function was recognized. A Basic Division was formed, which, without granting degrees in the liberal arts, was to form a broad base on which all technical education was to be built. Specifically, the Basic Division was charged with instruction in the fields of the humanities and social sciences, physical education and recreation, and was committed to provide the opportunities in general education necessary for a well-rounded program in all the technical fields pursued by State College students. In this, the Basic Division was in effect an integral part of all the technical Schools, since it brought to bear on all students of all years the impact of humane and social instruction to implement the technical and professional teaching of the degree-granting Schools. That this instruction was deemed significant at State College is shown by the fact that the portion of the curricular time devoted to these studies gradually increased until more than one-fourth of class instruction was done in the areas embraced by the Basic Division. Further recognition of the importance of the general education of technical students came with the action of the Board of Trustees in May, 1952, when the Basic Division was renamed the School of General Studies and placed on an equal basis with the technical Schools of State College.

The over-all objectives of the School of General Studies have become clear through the years. Its purposes are: to develop the student's communication and reading skills through the study of language and literature; to increase his understanding of the complex economic, social, political, and philosophical world in which he will live and work; to develop in him a sense of social responsibility as a scientist and technical leader in a world of technology and science; to teach him to think critically and scientifically in the social world of men as he does in the material world of his profession; to quicken his appreciation of the role played by both science and the arts in human affairs. Beyond the fundamental training in these fields as required by the technical curricula of the Schools, The School of General Studies also provides additional elective work in these areas so that each student may pursue further his own interests.

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* Retired April 1, 1948.

The School of General Studies includes the Departments of Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Physical Education and Intramurals, Social Studies, and Sociology. The Dean and Department Heads constitute the Administrative Board of the School. Working with them in matters of School policy and instruction is the School Faculty, consisting of the following full-time members:

Economics

Professor R. O. Moen, Head of the Department

Professors C. B. Shulenberger, T. W. Wood
Associate Professors P. F. Brookens, J. A. Lyons
Assistant Professors A. J. Bartley, E. O. Fails, Cleon W. Harrell
Special Lecturer H. E. Manning
Instructors *W. M. Goulding, Patrick Huntley, L. C. Larkin, V. A. Pikner, O. G. Thompson.

English

Professor Lodwick Hartley, Head of the Department

Professors J. D. Clark, A. M. Fountain, A. I. Ladu, R. P. Marshall, J. W. Shirley
Associate Professors P. H. Davis, H. G. Kincheloe, E. H. Paget, A. B. R. Shelley, R. B. Wynne
Assistant Professors J. W. McCullough, D. J. Rulfs, P. J. Rust, J. A. Shackford, L. H. Swain, R. G. Walser, W. K. Wynn
Instructors R. F. Bauerle, J. W. Gardner, Jr., B. G. Koonce, Henry M. Rosenberg, Huldah B. Turner, L. R. Whichard, J. A. Winterbottom
Visiting Professor Sadie J. Harmon

History and Political Science

Professor Preston W. Edsall, Head of the Department

Associate Professors L. W. Barnhardt, S. Noblin, L. W. Seegers
Assistant Professors M. L. Brown, C. F. Kolb, K. D. Raab, P. M. Rice
Instructor R. Beach

Modern Languages

Professor L. E. Hinkle, Head of the Department

Associate Professor S. T. Ballenger
Assistant Professors F. J. Allred, Mrs. R. B. Hall
Instructors V. A. Pikner, G. W. Poland

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* On leave of absence 1952-53.

Philosophy and Religion

Professor W. N. Hicks, Head of the Department

Assistant Professors P. A. Bredenberg, E. C. Gardner, J. L. Middleton

Physical Education

Professor Paul H. Derr, Head of the Department

Professor J. F. Miller
Assistant Professors E. B. DeGroat, C. G. Doak, W. E. Smith
Instructors J. B. Edwards, Jr., G. E. Hooks, H. Keating,
J. Kenfield, G. P. Perry*

Social Studies

Professor George A. Gullette, Head of the Department

Associate Professors C. I. Foster, R. E. Freund, J. R. Lambert,
Keith McKean.
Assistant Professors P. A. Bredenberg, H. Collins
Instructors Mrs. Ruth H. Bauerle, D. Lowenthal, *I. W. Surratt
Special Lecturer F. J. Paschal

Sociology

Professor Sanford R. Winston, Head of the Department

Assistant Professors E. H. Johnson, H. D. Rawls

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* On leave of absence 1952-53.

THE SCHOOL OF AGRICULTURE

**James Harold Hilton, Dean

Carey H. Bostian, Director of Instruction

Organization.—The School of Agriculture is organized in three divisions—Resident Instruction, Agricultural Extension and the Agricultural Experiment Station—to carry on the functions of instruction, extension and research. These divisions are organized as departments as follows: (a) Agricultural Economics, including Farm Marketing and Farm Management; (b) Agricultural Engineering, including Farm Structures and Farm Machinery; (c) Agronomy, including Field Crops, Soils, and Plant Breeding; (d) Animal Industry, including Animal Husbandry, Animal Nutrition, Dairy Production, and Dairy Manufacturing; (e) Biological Sciences, including Bacteriology, Plant Diseases, Plant Physiology, Entomology, Genetics, Animal Physiology, and Wildlife Management; (f) Chemistry; (g) Experimental Statistics; (h) Horticulture, including Pomology, Small Fruits, Floriculture, and Truck Farming; (i) Poultry Science, including diseases, breeding, feeding and management; and (j) Rural Sociology.

Purpose.—The purpose of the School of Agriculture is threefold: (1) To obtain through scientific research, experimentation, and demonstration accurate and reliable information relating to soils, plants, and animals, and to obtain from every available source reliable statistical, technical, and scientific data relating to every phase of agriculture that might be of advantage to the State; (2) to provide instruction in the College for young men who desire to enter the field of general agriculture, or wish to become professionals in agricultural education or specialists in any field of science related to agriculture; (3) to disseminate reliable information through publications and through extension agents, and by a wise use of this information to give instruction to agricultural workers in the scientific, experimental, and practical progress in the various lines of agriculture.

All effective instruction in agriculture is based on research and investigation; and the curricula are so organized that not only the subject matter for classroom instruction and extension work may be drawn from research, experimentation, and demonstration, but also that the students themselves shall have the opportunity to work under the direction of research specialists.

Admission; Advanced Standing.—Regulations for admission and for advanced standing are stated under Information for Applicants. (See pages 34-39.)

Curricula.—The curricula of the School of Agriculture are designed to meet both the practical and technical needs of the student. Moreover, the curricula provide for a broadened education by requiring certain courses and making it possible to elect others in language, literature, social sciences and the humanities.

The following curricula are offered:

A. GENERAL CURRICULUM IN AGRICULTURE

This curriculum is designed to give the student a broad training in the field of agriculture and at the same time permit him to major in the field

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** Resigned June 30, 1953.

of a particular interest. The student choosing this curriculum may elect to major in any Department of the School of Agriculture, except Agricultural Chemistry, Agricultural Engineering, and Statistics. Majors will be selected at the end of the third term of the freshman year.

Students taking this curriculum can find professional opportunities in agricultural extension work, on the staffs of State and Federal agricultural agencies, and as farmers, farm managers, inspectors of agricultural commodities, and specialists in agricultural industries and services.

GENERAL CURRICULUM

(220 credits required for graduation)

Variation from this curriculum will be allowed for Pre-veterinary students with the approval of the adviser and Director of Instruction.

(For majors in any department of the School of Agriculture except Agricultural Engineering, Chemistry, and Statistics)

Freshman Year

	Terms and Credits		
COURSES	F	W	S
Agr. 101—Intro. to Agriculture	1	0	0
Agron. 101—Intro. to Agronomy	3	or 3	0
A. I. 101 or 102—Dairy Science or An. Husbandry	3	or 3	0
*Chem. 201, 202—Gen. Inorganic Chem. or Hist. 121, 2	0	5 or 3	5 or 3
Eng. 101, 102, 103—Composition	3	3	3
Geol. 120—Physical Geology	0	0	4
Hort. 101—General Horticulture	3	0	or 3
Math. 111, 112—Algebra, Trigonometry	4	4	0
Poul. 101—General Poultry	3	0	or 3
**Mil. Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
**P. E. 101, 102, 103—Phys. Educ. and Hygiene	1	1	1
	17	18 or 16	18 or 16

Sophomore Year

COURSES	F	W	S
Agr. Econ. 303—Farm Management I	0	0	4
Agr. Engr. 211—Farm Equipment	3	0	or 3
Agron. 201—Soils	5	or 5	0
Bot. 101, 102—General Botany	0	4	4
Chem. 201, 202—if not taken during Freshman year			
Chem. 203—Introduction to Organic Chemistry	5	0	or 5
Econ. 301, 302—General Eonomics	3	3	0
Physics 215—General Physics	5	or 5	or 5
Rur. Soc. 201—Social Problems of Rural Life	3	0	or 3
Zool. 101, 102—General Zoology	4	4	0
**Mil. Science II or Air Science II	2	2	2
**P. E. 201, 202, 203—Phys. Education	1	1	1
	18	19	19

Junior and Senior Years

COURSES	Credits
History 121, 122 (if not taken previously) and Pol. Sci. 211	9
Public Speaking and Elective English, to be selected from courses in Advanced Writing and/or Literature	9
Forestry 311	3
Major Field	30-45
Agri. Electives (may be designated by adviser)	15-30
Electives in Social Science and Humanities	6
Electives, to be chosen with approval of adviser	24

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* Chem. 201 will be taken if student makes a "C" average or above on schedule for Fall Term and has passed either Retarded Algebra or Math. 111.

** Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

B. SPECIALIZED CURRICULUM IN AGRICULTURE

This curriculum is designed for students who want highly specialized training and who are looking forward toward graduate study in preparation for research and teaching positions. A maximum of science and a minimum of agriculture are provided to achieve this specialization. The student choosing this curriculum may elect to major in any department of the School of Agriculture.

SPECIALIZED CURRICULUM

For majors in any department in the School of Agriculture, with 220 credits required for graduation

Freshman Year

Agr. 101—Introduction to Agriculture
Chem. 101, 102 or 201, 202—General Inorganic Chemistry
Eng. 101, 102, 103—Composition
Hist. 121, 122—U. S. History
Math. 101, 102, 103 or Math. 111, 112, 123—Algebra, Trig., Anal. Geometry
Pol. Science 211—American Government
*Mil. Science 101, 102, 103 or Air Science 121, 122, 123
*P. E. 101, 102, 103—Physical Education and Hygiene

Sophomore Year

General Botany, Bot. 101, 102 or General Zoology, Zool. 101, 102
Three terms in sequence in Math, or Physics, or Chemistry
Public Speaking, Eng. 231, and six credits of Elective English (Adv. Writing or Literature)
*Military Science II, Mil. 201, 202, 203 or Air Science 221, 222, 223.
*Physical Education, P. E. 201, 202, 203
Fifteen to eighteen credits in agriculture or in mathematics and natural and physical sciences

Junior and Senior Years

Major department, 30-50 credits
Mathematics, Natural and Physical Sciences, in addition to courses stipulated for freshman and sophomore years, minimum of 20 credits
Foreign Language, 9 credits
General Economics, 6 credits
Electives in Social Science and Humanities, 6 credits
Agriculture, including credits earned during sophomore year, 15-18 credits
Free Electives in sufficient number to make a total of at least 220 credits

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

CURRICULUM IN AGRICULTURAL ENGINEERING

(See Page 82)

CURRICULUM IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

(See Page 92)

CURRICULUM IN DAIRY MANUFACTURING

(See Page 87)

CURRICULUM IN WILDLIFE CONSERVATION AND MANAGEMENT

(See Page 91)

Degrees.—The degree of Bachelor of Science is conferred upon the satisfactory completion of one of the curricula in this School.

The degree of Master of Science is offered in the various departments in the School of Agriculture for the satisfactory completion of one year of graduate study in residence.

The degree of Doctor of Philosophy is offered by certain departments. Candidates for advanced degrees are enrolled as students in the Graduate School. For further information consult the section of the Catalog devoted to the Graduate School.

Short Courses.—These courses vary in length from a few days to eight weeks. They are designed for young people who desire some training in the principles of agriculture, but who find it impossible to take the regular college course, and for mature individuals who wish to become familiar with the most recent agricultural practices. It is the aim of these courses to make better farmers—to help them produce better fruit, vegetables, livestock, and poultry, and to obtain greater satisfaction and profit from the time, energy, and money expended.

In these courses students will receive instruction from the best professors and will use all the facilities of the School of Agriculture. Most of the courses will be given during the winter months, and a bulletin will be issued each fall announcing the courses which will be offered during the following months. This bulletin and other information about the short courses may be secured by writing to the Director of Short Courses, College Extension Division, State College Station, Raleigh, N. C.

AGRICULTURAL ECONOMICS

Professor H. B. James, Head of Department

Professors G. W. Forester, W. W. McPherson; Associate Professors Charles E. Bishop, D. D. Brown, Rudolf E. Freund, Richard A. King, Lee R. Martin, W. H. Pierce; Instructor Margaret K. Fleming; Research Assistants R. V. Billingsley, A. J. Coutu, A. D. Seale, Jr.

The Department of Agricultural Economics is concerned with all the economic problems faced by farm families with respect to decisions concerning what to produce, how to produce efficiently, and the division of income between production and consumption uses. In both the teaching and research programs, emphasis is placed upon the organization and management of farms, farm mechanization, farm credit, landlord-tenant relations, marketing and processing farm products, and public policies affecting agriculture.

Program of Study.—The flexibility of the curriculum and the wide range of topics dealt with enable the Department to train students for many types of jobs in agriculture and other industries where a knowledge of agriculture and the economic principles applicable to agriculture are useful. Students have a choice of subjects in Farm Management, Marketing and Finance, and other phases of farm economics, as well as in the principles of agricultural economics around which these applied courses are built. Those who intend to earn a degree in Agricultural Economics should, during their freshman and sophomore years, give special attention to courses in economics, mathematics, and basic sciences. The degree of Bachelor of Science in Agricultural Economics may be earned under the provisions of either the General Curriculum in Agriculture (see page 77) or the Specialized Curriculum in Agriculture (see page 78).

The combined facilities of the Greater University and of the Agricultural Experiment Station afford exceptional opportunities for advanced study leading to the M.S. and Ph. D. degrees in Agricultural Economics. In the graduate training program, special emphasis is placed upon the economics of agricultural production and marketing, analysis of programs and policies affecting agriculture, and statistical techniques which aid in solving agricultural problems. The program includes courses in advanced economic theory and economic development with particular reference to agriculture.

Opportunities.—The rapid growth and development of industry and agriculture in North Carolina and throughout the South has resulted in an increased demand for workers who are specially trained in the fundamentals of technical agriculture and economic analysis. Many graduates of the Department of Agricultural Economics are employed in various agencies of the Federal and State governments engaged in research and educational work. These include the Agricultural Extension Service, the Agricultural Experiment Station, State Department of Agriculture, and various divisions of the United States Department of Agriculture. Others are engaged in professional work with commercial organizations dealing in agricultural credit, farm supplies and equipment, and the production, processing and marketing of agricultural products.

Facilities.—The Department is located on the second floor of Patterson Hall and is well supplied with all the modern equipment essential to its extensive research and teaching program. In addition, it has a modern and well equipped departmental library, including an excellent set of references to all the major professional journals in the field of Agricultural Economics and Experiment Station publications from other institutions throughout the United States. Charts and slides on all phases of agricultural economics are available for use of students and for other purposes. A great volume of information on actual farms is available for study and for illustrating the principles and practices of modern farm management. A large volume of statistical information on consumption, marketing, agricultural finance, taxation, insurance, soil conservation practices, and agricultural policy also is available for use of students and agricultural workers.

AGRICULTURAL ENGINEERING

Professor G. Wallace Giles, Head of the Department
Associate Professors F. J. Hassler, J. W. Weaver, Jr.
Assistant Professor Thomas V. Wilson
Instructors Ezra L. Howell, George B. Blum

Purpose.—This curriculum has been arranged to give its graduates fundamental training in engineering, basic training in the agricultural sciences, and a specialized study in courses involving the application of engineering knowledge to agricultural problems.

Breadth of Training.—Because of the great variety of work required of agricultural engineers, a number of subjects peculiar to other curricula is included, so that the student receives a considerable breadth of training. Engineering principles applied to agriculture have played an important part in the advancement and development of agricultural practices. Agricultural engineering as a profession, although of comparatively recent development, is rapidly becoming recognized as one of the more important of the engineering professions, since it is identified with the most important of industries—agriculture. This course is especially suited to the student brought up on the farm who has mechanical inclination, as it prepares him for a profession, a business, or a career in farming, and enables him to capitalize on his farm experience.

Occupations Open to Graduates.—A variety of occupations is open to graduates in Agricultural Engineering. The more important ones are Teaching, Experiment Station, and Extension Service positions with Land-Grant Colleges and the Government: Engineers in Land Reclamation, Drainage, or Irrigation Enterprises; Designing, Advertising, Sales and Promotion Work with the Manufacturers of Farm Machinery, Equipment, and Building Materials; Rural Electrification Work with Public Utilities, Farmers Electric Cooperatives, and Private Work; Editorial Work with Publishers; Appraisal; and Agricultural-Engineering Consultant Service.

Because of the varied nature of the above occupations, the work in the Agricultural Engineering Department has been divided into four Options: (1) Power and Machinery; (2) Rural Structures, which includes Materials and Methods of Construction, Sanitation, and Building Equipment; (3) Land Improvement, which includes Irrigation, Drainage, Soil Erosion Control, and other forms of mechanical improvement of agricultural lands; and (4) Rural Electrification.

Facilities—The offices, classrooms, and shops used in Agricultural Engineering are in the Agricultural Engineering Building and Tompkins Hall.

The farm machinery laboratory has the latest labor-saving farm equipment for seedbed preparation, planting, cultivating, harvesting, and crop preparation. These machines are furnished by the leading farm machinery manufacturers, and are replaced from time to time as improvements are developed. Special effort is made to have on hand all types of equipment for use in the best practices in the production of farm crops.

The farm engines and tractors laboratory is equipped with various makes and styles of tractors and supplementary farm power units. Tools and equipment most commonly used by service shops are available. Other equipment consists of drawbar and belt dynamometers for testing.

The farm shop located in Tompkins Hall is considered one of the finest teaching shops of its kind. It is completely equipped with the latest power and hand tools.

A research shop operated for Experiment Station is available for the use of senior students doing research work in the course "Special Problems." It is considered the best equipped shop of its kind in the nation.

The farm buildings laboratory is equipped with drawing tables, blue print machine, supply cabinets, and models of various types of farm buildings construction.

The rural electrification laboratory is equipped with the latest types of electrical appliances and devices as used by farmers on rural lines. Much of this equipment is loaned by manufacturers.

Laboratory equipment for land improvement consists of sets of surveying instruments, drafting tables, calculating equipment and field machines for this type of work.

Field laboratory areas in crops, vineyards, orchards and pastures are available for demonstrations and practice in the use of farm equipment and in drainage and erosion control.

CURRICULUM IN AGRICULTURAL ENGINEERING

(226 credits required for graduation)

Freshman Year

COURSES	Terms and Credits		
	F	W	S
Agr. 101—Introduction to Agriculture	1	0	0
Agr. Engr. 101, 102—Farm Mechanics for Engineers	3	3	0
Agron. 101—Introduction to Agronomy	3	0	0
Bot. 101—General Botany	0	4	0
Eng. 101, 102, 103—Composition	3	3	3
Geol. 120—Physical Geology	0	0	4
Math. 101, 102, 103—Algebra, Trigonometry, Anal. Geometry	4	4	6
M.E. 101, 102, 103—Engineering Drawing	2	2	2
*Mil. Science 101, 102. 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Phys. Education and Hygiene	1	1	1
	19	19	18

Sophomore Year

COURSES	F	W	S
Chem. 101, 102—General Inorganic Chemistry	4	4	0
C.E. 203—Surveying I	3	0	0
Econ. 301, 302—General Economics	0	3	3
Eng. 211—Business Correspondence	0	0	3
Math. 201, 202—Calculus I, II	4	4	0
M.E. 201—Descriptive Geometry	0	0	2
Physics 201, 202, 203—General Physics	5	5	5
Rur. Soc. 201—Social Problems of Rural Life	0	0	3
*Mil. Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	19	19

Junior Year

COURSES	F	W	S
Agr. Econ. 303—Farm Management I	0	0	4
Agr. Engr. 201—Farm Conveniences	3	0	0
Agr. Engr. 331—Farm Machinery	4	0	0
Agr. Engr. 341—Soil and Water Conservation I	0	3	0
Agr. Engr. 351—Farm Structures	0	3	0
Agr. Engr. 362—Rural Electrification I	0	3	0
Agron. 201—Soils	0	5	0
A.I. 101 or 102—Dairy Science or Animal Husbandry	3	0	0
E.E. 320, 325—Elem. of Elec. Engr. and Elec. Engr. Lab.	4	0	0
Eng. 231—Public Speaking	0	0	3
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
E.M. 321—Strength of Materials	0	0	3
M.E. 202—Machine Drawing	0	0	2
Military Science, Air Science, or Option Courses	3	3	3
	20	20	18

Senior Year

COURSES	F	W	S
Agr. Engr. 332—Farm Engines and Tractors	0	4	0
Agr. Engr. 352—Curing and Drying of Farm Crops	0	0	3
Agr. Engr. 401—Senior Seminar	1	1	1
Agr. Engr. 441—Soil and Water Conservation II	3	0	0
Agr. Engr. 451—Farm Structures Design	0	0	3
Agr. Engr. 462—Rural Electrification II	0	3	0
Agr. Engr. 502—Spec. Probs. in Agr. Engr.	0	3	0
Eng. 321—Technical Writing I	3	0	0
E.M. 430—Fluid Mechanics	3	0	0
Hist. 333—History of American Agriculture	0	3	0
Pol. Science 211—American Government	0	0	3
Elective in Social Science or Humanities	3	0	0
Military Science, Air Science, or Option Courses	3	3	3
Option Courses	3	3	3
	19	20	16

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

OPTIONS

One of the following options must be selected no later than the beginning of the junior year. If Advanced Military is taken, a minimum of 9 credits must be earned in one of the following options. If Advanced Military is not chosen, students will take all courses under one of the following options and enough electives to make a total of 226 credits.

Land Improvement

COURSES	Terms and Credits		
	F	W	S
Agron. 302—Soil Classification	0	0	4
Agron. 401—Soil Conservation	0	3	0
Agron. 412—Pastures and Forage Crops	0	0	4
C.E. 204—Surveying II	0	3	0
C.E. 484—Hydraulics	0	3	0
For. 311—Principles of Farm Forestry	3	0	0
	3	9	8

Power and Machinery

Agr. Engr. 431—Mechanics, Selection and Service of Machinery	0	0	4
Agr. Engr. 531—Farm Machinery Design	0	3	0
C.E. 333—Materials Testing Laboratory	0	0	2
I.E. 115, 116—Foundry and Welding Laboratory	1	1	0
I.E. 227, 228, 229—Machine Tool Laboratory	1	1	1
M.E. 321—Metallurgy	0	0	3
	2	5	10

Farm Structures

C.E. 331, 332, 333—Materials Testing Laboratory	2	2	2
Design 222—Materials of Construction	0	3	0
E.M. 422—Strength of Materials	0	0	3
For. 453—Lumber Structures	0	3	0
M.E. 371—Fundamentals of Gases and Vapors	3	0	0
	5	8	5

Rural Electrification

Agr. Engr. 313—Dairy Engineering	0	3	0
A.I. 323—Meat and Meat Products	0	5	0
E.E. 321—Elements of Electrical Engineering II	0	3	0
E.E. 326—Electrical Engineering Laboratory	0	1	0
E.E. 337—Illumination	0	0	3
M.E. 371—Fundamentals of Gases and Vapors	3	0	0
	3	12	3

AGRONOMY

Professor W. E. Colwell, Head of Department

Professor E. T. York, Jr., In Charge Agronomy Teaching
Professors: J. W. Fitts, W. C. Gregory, N. S. Hall, P. H. Harvey, J. F. Lutz, G. K. Middleton, W. L. Nelson, W. G. Woltz, W. W. Woodhouse, Jr.
Associate Professors: N. T. Coleman, G. C. Klingman, W. D. Lee, C. D. McAuliffe, T. J. Mann, A. Mehlich, E. V. Miller, C. H. M. van Bavel
Assistant Professors: D. S. Chamblee, G. L. Jones, S. B. McCaleb

Objectives.—The curriculum in Agronomy has as its objectives training in the fundamental principles of the soil and the plant sciences along with the application of these basic principles to the practical problems of crop production and soil management.

Importance.—The importance of agronomic training in North Carolina agriculture is evidenced by the fact that North Carolina ranks third among the states in cash income from farm crops. Yet the maximum potential production of farm crops has by no means been attained. With continued improvement in varieties, fertilization practices, cultural methods, and other cropping and soil management practices, further advances will be made. In carrying out this broad program there is and will continue to be a real need in North Carolina for men well trained in plant breeding, soils, crop production and management, and related fields.

Opportunities.—Graduates in Agronomy are trained to fill positions as County Extension Agents, farm operators and managers, Soil Conservation Service representatives, technicians or salesmen in fertilizer companies and similar commercial concerns, seed analysts, and as leaders in various forms of agricultural development work. The Agronomy curriculum also offers training for those students who might want to continue their education with graduate study in preparation for extension, teaching, or research positions with state or federal institutions.

Facilities.—A new Agronomy building provides adequate office, laboratory, and classroom space for the entire teaching, research, and extension personnel of the department. In addition to the research laboratories for staff and graduate student use, several well-equipped laboratories are maintained to serve the needs of the teaching program. A departmental library is equipped with books, periodicals and bibliographic material dealing with agronomic and closely related subjects. Greenhouses are situated directly in the rear of the Agronomy Building to serve the needs for such facilities in the teaching and research programs. Much of the research is carried out on the campus at Raleigh and at some fifteen experiment stations located throughout the state. Students have the opportunity of observing, first hand, various phases of this research. Furthermore, many students gain valuable experience as well as financial assistance by working part-time during the school year or full-time in the summer in one of these research programs.

Student Tour.—One of the highlights of the undergraduate curriculum is a tour of the State taken by students majoring in Agronomy during the junior year. This tour is normally taken immediately following the end of the spring term and lasts approximately six days. During this time the student visits all of the principal farming regions in the State and has an opportunity to observe the management practices used on representative farms in each region. He also visits a number of the state agricultural experiment stations as well as various commerical concerns such as fertilizer manufacturers, seed producers, and tobacco companies. This tour serves the purpose of providing the student with a better concept of the various agricultural enterprises throughout the State.

Graduate Study.—The combined facilities of the consolidated University and of the Experiment Station provide excellent opportunity for advanced training leading to Master of Science and Doctor of Philosophy degrees in Agronomy. The advanced courses offered in Agronomy and related fields fulfill the need of graduate work in the following:

Soil Science
Soil Chemistry
Soil Physics
Soil Fertility
Soil Genesis
Plant Breeding
Crop Production
Weed Control

CURRICULA

The Agronomy curriculum is designed to meet the diverse interest of the students by offering the choice of two programs of study: (1) a General Agronomy Option and (2) a Specialized Agronomy Option, both of which are outlined below. The General Option permits a broad agricultural training by requiring only the basic courses in Agronomy and closely related fields, thereby permitting the student to elect more courses in other departments in the School of Agriculture.

The Specialized Option is designed to permit the student to take some of the more advanced courses in Agronomy and related fields and less of the general agricultural courses. Upon electing the Specialized Option, the student may receive advanced training in the following:

Crop Production and Management
Plant Breeding
Soils

The Specialized Option is particularly well suited to the preparation of students for graduate study by providing course work in the physical and natural sciences which are basic to the different phases of advanced agronomic training. It is recommended that a first year student elect the Specialized Curriculum in Agriculture (B) if he plans to take the Agronomy Specialized Option; however, it is possible for a student to take the Agronomy Specialized Option even though he is registered in the General Curriculum in Agriculture (A).

The following courses are required in the two curricula:

I. General Agronomy Option

A. General requirements as outlined in the catalogue, pages 76 and 77.

B. Specific courses in major field.

	Credits
Crop Production I, Agronomy 311	4
Pastures and Forage Crops, Agron. 412	4
Soil Fertility and Fertilizers, Agronomy 301	4
Soil Classification, Agronomy 302	4
Genetics, Gen. 411	5
Plant Physiology, Botany 421	5
Plant Breeding, Agronomy 413	3
Plant Diseases, Plant Path. 315	4

C. At least one course must be elected from each of five different departments in the School of Agriculture.

II. Specialized Agronomy Option

A. General requirements as outlined in the catalogue, pages 76 and 77.

B. Specific courses in major field
(Same as above (I-B) for General Agronomy Option)

C. At least five of the following courses will be elected, the choice being dependent upon whether the student wishes special training in Soils, Plant Breeding, or Crop Production and Management.

Soil Fertility Evaluation, Agron. 501	4
Soil Physics, Agron. 503	4
Soil Chemistry, Agron. 502	4
Soil Microbiology, Agron. 504	3

	Credits
Soil Management, Agron. 401	3
Petrology, Geol. 443	4
Qualitative Analysis, Chem. 103	4
Quantitative Analysis, Chem. 211	4
General Biological and Plant Chemistry, Chem. 451, 452, 455*	4, 4, 4
Organic Chemistry, Chem. 421, 422, 423*	5, 5, 5
Plant Ecology, Bot. 541	3
Systematic Botany, Bot. 203	3
General Bacteriology, Bot. 412	4
Diseases of Field Crops, Plant Path. 515	4
Weeds and their Control, Agron. 414	3
Crop Production II, Agron. 411	4
Genetics, Gen. 412	3
Statistics 311	4
Math. 123, 211, 212*	4, 3, 3

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* The complete sequence of three courses may be elected; however, the full sequence or any part thereof may serve as only one of the five electives required under this option.

ANIMAL INDUSTRY

Professor D. W. Colvard, Head of the Department

Professors C. D. Grinnells, F. M. Haig, E. H. Hostetler, W. M. Roberts, M. L. Speck, F. W. Sherwood, H. A. Stewart, R. K. Waugh, G. H. Wise
Associate Professors E. R. Barrick, T. N. Blumer, J. E. Legates, G. Matrone, J. C. Osborne, F. H. Smith, F. G. Warren
Assistant Professors J. P. Ammerman, L. W. Aurand, R. B. Casady, E. U. Dillard, Lemuel Goode, W. R. Murley, R. B. Redfern, S. B. Tove, R. L. Moore
Instructors W. L. Brown, L. F. Blanton, R. M. Myers, W. W. Smart, Jr.

The Department of Animal Industry is housed in Polk Hall, a three-story building, which was designed to meet the needs of the college teaching, research, and extension work in Animal Production and Dairy Manufacturing.

In the basement of Polk Hall are two wings, one of which is devoted to Dairy Manufacturing, and the other to farm animal slaughtering and meat preservation. The dairy laboratories are equipped with the most modern machinery available for teaching and research in the processing and distribution of market milk, ice cream, butter, cheese and other dairy products.

The Farm Meats laboratories are well equipped, making them among the most modern and up-to-date of any in the country.

The upper floors of the building contain offices, classrooms, library and laboratories in dairy bacteriology, dairy chemistry, animal nutrition, animal physiology, animal breeding and meats. Extension specialists in swine, dairy, beef cattle, and sheep have offices in this building.

In addition, the Department of Animal Industry maintains three livestock farms located a few miles from the college.

The Dairy Farm contains 900 acres. Two fireproof, completely equipped dairy barns house 200 registered Jerseys, Guernseys, Holsteins and Ayrshires. A judging pavilion and an artificial breeding bull barn, equipped with laboratories, have recently been completed. A research center accommodates animals for experimental purposes. The Animal Husbandry Farm, adjoining the Dairy Farm, contains 1100 acres. Here registered and commercial herds of swine, sheep, and beef cattle are maintained for research and teaching.

Two curricula are offered in the department—one in Animal Industry, the other in Dairy Manufacturing.

Students wishing to major in some phase of Animal Industry such as Animal Husbandry, Dairy Husbandry, or Animal Nutrition, will elect not less than 30 credits and not more than 45 credits of course work in the Department of Animal Industry, under the supervision of the faculty adviser. Since this curriculum is very flexible, it is possible for students to specialize in preparation for graduate work in Animal Breeding, Nutrition and other animal sciences.

Students wishing to major in Animal Husbandry, Dairy Husbandry, or some other phase of Animal Industry will take the General Curriculum in Agriculture (see pages 76 and 77).

Students wishing to specialize in Dairy Manufacturing will follow the Curriculum in Dairy Manufacturing, which is shown below:

CURRICULUM IN DAIRY MANUFACTURING

(220 credits required for graduation)

Freshman Year

Same as General Curriculum in Agriculture (see page 76)

Sophomore Year

COURSES	Terms and Credits F	W	S
Bot. 101—General Botany	0	4	0
Bot. 412—General Bacteriology	0	0	4
Chem. 201, 202—if not already passed	5	5	0
Chem. 203—Introduction to Organic Chemistry	5	0	or 5
D.M. 201—Dairy Technology	3	0	0
Econ. 301, 302—General Economics	0	3	3
Eng. 231—Public Speaking	0	3	0
Hist. 121, 122—U. S. History (if not already passed)	3	3	0
Physics 215—General Physics	5	0	or 5
Pol. Science 211—American Government	0	0	3
Psych. 200—Intro. to Psychology	0	3	0
Zool. 101—General Zoology	4	0	0
*Mil. Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	18 or 20	19 or 21	18

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

Junior and Senior Years

COURSES	Credits
Electives in English (Advanced Writing or Literature)	6
Major Department	30-45
Required Courses Outside Major	25-40
Electives in Social Science and Humanities	6
Electives, to be chosen with approval of adviser	30

THE DIVISION OF BIOLOGICAL SCIENCES

The Division of Biological Sciences was organized in 1950 for the purpose of enlarging the facilities and the opportunities for undergraduate and graduate study in the biological sciences. The Division is made up of five separate faculties: Botany, Entomology, Genetics, Plant Pathology, and

Zoology, each with its own administrative head and staff members. Plans are being formulated to add a faculty in bacteriology to the staff of the Division. The courses offered by the faculties of the Division serve as the foundation upon which the work of the applied fields in Agriculture and Forestry is based. Opportunity for research programs leading to the Master's and the Doctor's degrees is provided in the Division.

The Division of Biological Sciences occupies a large and modern building, Gardner Hall, on the west campus. The excellent facilities for teaching and research provided in the building are augmented by a series of new greenhouses in an adjacent area. The new building and its modern equipment offer students of the biological sciences exceptional opportunities for study and research.

BOTANY

Professor H. T. Scofield, Head

Professors D. B. Anderson, B. W. Wells
Associate Professors Ernest Ball, L. A. Whitford
Assistant Professors H. J. Evans, W. B. Fox[1], R. K. Godfrey[2],
Instructors H. H. Wiebe, W. A. Peterson

Botany emphasizes those phases of plant science which are foundational for the work in Agriculture and Forestry. Undergraduate students may specialize in Botany under the provisions of either the General Curriculum or the Specialized Curriculum. Graduate work may be undertaken in several of the specialized fields of Botany.

The general teaching laboratories are equipped with all the essential facilities for the courses offered. Well organized Herbaria support the work in systematic botany and dendrology. Laboratories for advanced study and research in specialized fields are equipped with modern instruments and other essential physical facilities. New greenhouses provide Botany adequate space under glass for teaching and research purposes.

ENTOMOLOGY

Professor Clyde F. Smith, Head

Professors B. B. Fulton, Z. P. Metcalf, T. B. Mitchell, H. K. Townes*
Associate Professors C. H. Brett, W. M. Kulash
Assistant Professors J. R. Dogger, R. T. Gast, W. A. Stephen

The Entomology Faculty offers instruction at both undergraduate and graduate levels and provides students desiring to major in Entomology the broad and fundamental training necessary in this profession. Undergraduate instruction is also designated to provide introductory and terminal courses in insect control technology for students majoring in agronomy, animal industry, horticulture, vocational education and forestry. Graduate courses are available for students wishing to complete requirements for the M.S. or Ph.D. degrees in Entomology, as well as students majoring in any of the plant or animal sciences.

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[1] Deceased November 13, 1952.
[2] On leave 1952-53.
* On leave 1952-54.

Facilities include air-conditioned laboratories and greenhouse space, fields for experimental work, general and specialized insect collections, a small apiary for beekeeping, modern laboratory equipment and other equipment essential to advanced research work.

Since Entomology is of importance in every phase of agriculture, it is necessary for students majoring in entomology to have a broad and fundamental training; therefore, students may go into entomology from the general or the specialized curriculum in agriculture.

Teaching and research assistantships are available for qualified students.

GENETICS

Professor S. G. Stephens, Head

Professor C. H. Bostian; Associate Professors D. S. Grosch and B. W. Smith

Cooperating with the following Associate Members of the Faculty:

Agronomy—D. U. Gerstel, W. C. Gregory, C. H. Hanson, P. H. Harvey, H. W. Johnson, G. L. Jones, T. J. Mann, G. K. Middleton, P. A. Miller, D. L. Thompson.

Animal Industry—H. A. Stewart and J. E. Legates.

Horticulture—W. S. Barham, F. D. Cochran, F. L. Haynes, and G. W. Schneider.

Poultry—E. W. Glazener.

Statistics—R. E. Comstock, H. F. Robinson.

The Genetics Faculty offers instruction at advanced undergraduate and graduate levels. Graduate courses are available for students majoring in any of the animal and plant sciences, as well as for those wishing to complete requirements for the Master's or Doctor's degree in Genetics.

At North Carolina State College there are no sharp divisions along departmental lines between the theoretical and applied aspects of genetics. Courses embodying genetic principles are also offered by the five cooperating departments listed above.

Facilities are available for carrying out research projects in the Genetics Faculty, and also on a cooperative basis in other departments as indicated by the nature of the project.

PLANT PATHOLOGY

Professor James H. Jensen, Head

Professors S. G. Lehman, J. L. Allison, D. E. Ellis, C. N. Clayton, C. J. Nusbaum

Associate Professor L. W. Nielsen

Assistant Professors T. T. Hebert, A. Kelman, G. B. Lucas

The Plant Pathology Faculty offers instruction at both undergraduate and graduate levels. Undergraduate instruction is designed to provide students majoring in agronomy, horticulture, vocational education, and forestry introductory and advanced courses in the nature and control of plant diseases. Graduate courses are available for students majoring in any of the plant sciences as well as for those wishing to complete requirements for the Master of Science or Doctor of Philosophy degrees in Plant Pathology.

Facilities consist of ample laboratory and greenhouse space, fields for experimental work, modern laboratory equipment including refrigeration, temperature control chambers, optical equipment, and other needs essential to advanced research.

ZOOLOGY

Professor F. S. Barkalow, Jr., Head

Professors B. B. Brandt, R. Harkema, Z. P. Metcalf
Associate Professors J. L. Evers, T. L. Quay

Zoology at North Carolina State is organized to fulfill a threefold function. (1) It serves the schools of Agriculture, Forestry, and Education by teaching courses of a fundamental nature essential to complete understanding and mastery of applied science. (2) It provides training in technical zoology which prepares students for positions in industrial and government laboratories. (3) It furnishes potential leaders in the field of wildlife conservation and game management.

CURRICULUM—A curriculum in Wildlife Conservation and Management is offered as a part of the work in zoology.

WILDLIFE CONSERVATION AND MANAGEMENT

CURRICULUM—Interest in wildlife, hunting and fishing is a prerequisite of a wildlife biologist, but enthusiasm alone is not sufficient. A student must possess scholastic aptitude, initiative, and the ability to use the tools of pure and applied biology.

The wildlife curriculum is based on the following principles: all major forms of plant and animal life must be considered in wildlife management; by providing a favorable environment, a wildlife species will usually produce surpluses which can be harvested. Since wildlife conservation and management is essentially applied biology, the curriculum is designed to provide a thorough knowledge of zoology and botany.

Every phase of the wildlife field involves numerous contacts with the public. The ability to speak and write in an effective manner is a valuable asset. The course requirements in English were selected to provide such training.

Stream pollution and fisheries problems require a knowledge of chemistry for their solution. Adequate courses are included in the curriculum to satisfy this training need.

POSITIONS—Five categories of positions are available to wildlife graduates: administrative, law enforcement, refuge, education, and research. Those agencies employing the majority of men are: State game and fish departments, U. S. Fish and Wildlife Service, U. S. Forest Service, U. S. Soil Conservation Service, U. S. National Park Service, and other federal land-use departments. The curriculum is designed to furnish a technical and practical foundation for employment with these agencies.

Employment opportunities continue to be good, especially at the graduate level. No excess of wildlife graduates is anticipated in the immediate future.

STATE ADVANTAGES—Unusual advantages are offered by the wide range of natural environments in the North Carolina Coastal Plain, Piedmont, and Mountain Regions. Close cooperation with the North Carolina Wildlife Resources Commission provides opportunities for observing developments in wildlife management on its fifteen wildlife management and refuge areas.

CURRICULUM IN WILDLIFE CONSERVATION AND MANAGEMENT

(220 credits required for graduation)

Freshman Year

	Terms and Credits		
COURSES	F	W	S
Bot. 101, 102, 203—General and Systematic Botany	4	4	3
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S History	3	3	3
I.A. 103—Industrial Arts Drawing	3	0	0
Math. 111, 112—Algebra, Trigonometry	0	4	4
Zool. 111—Elementary Wildlife Management	1	0	0
Zool. 101, 102—General Zoology	0	4	0
*Mil. Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education and Hygiene	1	1	1
	17	18	20

Sophomore Year

	F	W	S
C.E. 203—Surveying I	3	0	0
Chem. 201, 202, 203—Gen. Inorganic and Organic Chemistry	5	5	5
English 231—Public Speaking	0	3	0
English elective (literature or advanced composition)	3	0	0
Geol. 120—Physical Geology	0	0	4
Physics 215—General Physics	0	0	5
Pol. Science 211—American Government	3	0	0
Zool. 223—Comparative Anatomy	0	5	0
Zool. 251, 252, 253—Ornithology	2	2	2
*Military Science II or Air Science II	2	2	2
*P. E. 201, 202, 203—Physical Education	1	1	1
	19	18	19

Junior Year

	F	W	S
Agron. 201—Soils	0	5	0
Bot. 211, 213, 412—Dendrology and Gen. Bacteriology	3	3	4
Bot. 573 —Aquatic Botany	0	0	3
Chem. 103—Qualitative Analysis	0	0	4
Econ. 301, 302—General Economics	0	3	3
Electives	3	3	4
Ent. 302—Economic Entomology or Ent. 311—Intro. to Forest Insects	0	4	0
For. 311—Principles of Farm Forestry	3	0	0
Zool. 301, 321—Animal Physiology, Wildlife Conservation	5	3	0
Zool. 521—Limnology	4	0	0
	18	21	18

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

Senior Year

COURSES	Terms and Credits F	W	S
Agron. 311—Crop Prod. I: Food and Feed Crops	4	0	0
Bot. 541—Plant Ecology	3	0	0
Chem. 211—Quantitative Analysis	0	4	0
Elective in English (Literature or Adv. Composition)	0	0	3
Elective in Social Science	0	3	0
Electives	3	6	3
Gen. 411—Genetics	5	0	0
Zool. 315—Animal Parasitology	0	0	4
Zool. 523—Animal Ecology	0	0	5
Zool. 551, 552, 553—Wildlife Management	3	3	3
	18	16	18

CHEMISTRY

Professor W. J. Peterson, Head of the Department

Professors W. L. Lott, W. A. Reid, G. H. Satterfield, F. W. Sherwood, P. P. Sutton; Associate Professors T. G. Bowery, W. E. Jordan, R. H. Loeppert, C. C. Robinson, M. F. Showalter, F. H. Smith, J. A. Weybrew; Assistant Professors R. R. Hentz, C. W. Jennings, C. S. Nevin, S. B. Tove, R. C. White
Instructors T. J. Blalock, W. P. Ingram, Jr., J. W. Morgan, G. M. Oliver
Research Instructor H. F. Krackenberger

Curriculum.—This curriculum is designed to give students fundamental training in mathematics and the biological and physical sciences with a maximum of chemistry. It is a preparation for work in Experiment Stations, laboratories maintained in connection with programs for the inspection and control of foods, pharmaceutical products, animal feeds, fertilizers, gasoline and other materials; and for technical and business positions in the processing, manufacture, sale, distribution and use of a wide range of agricultural and industrial products. The curriculum also provides an excellent preparation for graduate study leading to research and teaching positions.

This Curriculum meets the requirements of the American Chemical Society for the training of professional chemists.

CURRICULUM IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

(220 credits required for graduation)

Freshman Year

COURSES	Terms and Credits F	W	S
Chem. 201, 202, 205—Gen. Inorganic and Qual. Chemistry	5	5	5
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S. History	3	3	0
Math. 101, 102, 103—Algebra, Trigonometry, Anal. Geometry	4	4	6
Pol. Science 211—American Government	0	0	3
*Mil. Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Phys. Education and Hygiene	1	1	1
	18	18	20

Sophomore Year

COURSES	Terms and Credits F	W	S
Bot. 101, 102—Gen. Botany or Zool. 101, 102—Gen. Zool.	4	4	0
Chem. 211, 212—Quantitative Analysis	4	4	0
Electives	0	0	8
†English, electives	3	3	3
Math. 201, 202, 203—Calculus I, II, III	4	4	4
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	18	18	18

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† Students certified as proficient in English may substitute courses in modern language. A minimum of nine credits in German is required for graduation. It is recommended that eighteen credits in German be taken by students contemplating graduate studies.

* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

Junior Year

COURSES	Credits
Chem. 213—Quantitative Analysis	4
Chem. 421, 422, 423—Organic Chemistry	15
Electives (See note below)	9
M.L. 103, 104, 205 or 206—Elem. German, German Prose	9
Physics 201, 202, 203—General Physics	15
Zool. 101, 102—General Zoology or Bot. 101, 102—Gen. Botany	8

Senior Year

Chemistry 531, 532, 533—Physical Chemistry	12
*Chemistry Electives	12
Economics 301, 302—General Economics	6
Electives (See note below)	20

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* Suggested electives: Analytical Chemistry, Chem. 537; Biological Chemistry, Chem. 551, 552, 553, 555, 561, 562, 563, 571, 572; Organic Chemistry, Chem. 430, 527, 528, 529; Colloid Chemistry, Chem. 542.

Electives must include a minimum of 6 credits in Social Sciences, and if Advanced Military Science is elected, a minimum of 11 credits in Agriculture. If Advanced Military Science is not elected, electives must include a minimum of 18 credits in Agriculture.

HORTICULTURE

Professor M. E. Gardner, Head of Department

Professors: F. D. Cochran, J. L. Etchells, I. D. Jones, G. O. Randall
Associate Professors: W. S. Barham, J. H. Harris, E. W. McElwee,
E. B. Morrow, D. T. Pope, Robert Schmidt, G. W. Schneider, C. F. Williams
Assistant Professor: F. L. Haynes
Instructor: C. L. McCombs

The field of Horticulture is concerned with the application of basic scientific principles in the production, handling, and marketing of fruits, vegetables, and ornamental plants; also in the processing of fruits and vegetables. The variations in climatic conditions found in North Carolina are conducive to the production of a wide variety of horticultural crops which are distributed throughout the state as commercial enterprises and as home gardens. While these crops now represent an important segment of agriculture in the state, further expansion will be realized with development of adapted varieties, mechanization and intensification of cultural practices, and improvement of handling and marketing methods.

Facilities—The department now has one of the best physical plants in the south for training students in Horticulture. The new building, completed in

1952, to house Horticulture and Forestry, contains adequate office, classroom, and laboratory space and the equipment necessary for a well rounded program of teaching and research. The departmental library, which supplements the main library, contains about twenty-five thousand technical and popular bulletins, and current periodicals and journals covering all phases of horticulture.

A new greenhouse range is available which contains ten separate 24′ x 30′ compartments especially designed for research. This addition to the present range will make approximately 25,000 sq. ft. of glass available for research and teaching. Nine cold storage rooms will make possible intensive investigations dealing with storage, handling and breeding problems.

A student laboratory with cold storage facilities is located on a twenty-five acre tract near the city limits of west Raleigh. Student gardens, orchards, nursery and flower plots, and vineyards are utilized for class instruction. Field research problems are conducted on this student laboratory farm and at ten of the branch stations and laboratories located in the various geographical sections of the state. Students have the opportunity of observing, first hand, various phases of this research. Many students gain valuable experience as well as financial help by working part-time during the school year, or full-time in the summer, assisting in these programs.

New and enlarged facilities are available in the field of fruit and vegetable processing for both teaching and research. These include a modern well equipped processing laboratory; adjoining chemical and bacteriological laboratories; a freezing room; and storage lockers for frozen products.

Opportunities—Graduates in Horticulture are trained to fill many different types of positions among which are county extension agents; farm operators; orchard, nursery, greenhouse and flower shop managers; research and promotional work with commercial seed, floral, chemical, and food companies; processing plant foreman; inspectors and quality control technologists; U.S.D.A. regulatory service; and as leaders in other phases of agricultural development.

Qualified students who wish to prepare themselves for more technical positions with industrial, state, and federal agencies have an opportunity to take graduate study in all phases of Horticulture.

CURRICULA

The Curricula in Horticulture are designed to conform either to the General Curriculum or the Specialized Curriculum in Agriculture. Either curriculum provides training for developing a background in the fundamental principles of the plant sciences and the application of these principles to problems of production, breeding, handling, storage, marketing, and processing of horticultural crops.

Five options are offered Horticultural Majors:

1. General Horticulture
2. Fruit Crops
3. Ornamental Crops
4. Vegetable Crops
5. Fruit and Vegetable Processing

Options 1, 2, 3, and 4, may be taken under either curriculum A or B. Option 5 is offered only under the Specilized Curriculum (B). The requirements for each option are as follows:

1. Option in General Horticulture (curriculum A or B)

A. General requirements as outlined in the catalogue, pages 76 and 77.

B. Requirements in major field—

	Credits
Soil Fertility and Fertilizers, Agron. 301	4
Plant Propagation, Hort. 301	3
Plant Diseases, Plant Path. 315	4
Plant Physiology, Bot. 421	5
Genetics, Gen. 411	5
Plant Breeding, Agron. 413	3
Econ. Entomology, Ent. 302	3
General Bacteriology, Bot. 412	4

C. Horticultural electives to complete requirement of 30 to 45 hours.

2. Options in Fruit, Ornamental, and Vegetable Crops (Curriculum A or B)

A. General requirements as outlined in the catalogue, pages 76 and 77.

B. Requirements in major field (same as 1-B of General Option).

C. Requirements in specialized field—

Option 2, Fruit Crops—	Credits
Commercial Fruit Production, Hort. 421	5
Small Fruits Production, Hort. 422	3
Grading, Packing, and Judging Fruit and Vegetable Crops, Hort. 321	3
Advanced Commercial Fruit Production, Hort. 532	3
Handling and Storage of Fruits and Vegetables, Hort. 562	3
Electives in Horticulture	7-22

Option 3. Ornamental Crops—	Credits
Woody Plants, Hort. 201, 202, 203	9
Commercial Floriculture, Hort. 313	4
Landscape Gardening, Hort. 403	3
Commercial Floriculture, Hort. 441, 442, 443	9
or	
Nursery Practice, Hort. 311; Herbaceous Plants, Hort. 213	6
Handling and Storage of Ornamental Plants, Hort. 512	3
Electives in Horticulture	2-15

Option 4. Vegetable Crops—	Credits
Vegetable Growing, Hort. 303	3
Grading, Packing, and Judging of Fruit and Vegetable Crops, Hort. 321	3
Commercial Vegetable Growing, Hort. 431, 432, 433	9
Handling and Storage of Fruits and Vegetables, Hort. 562	3
Electives in Horticulture	6-21

3. Specialized Curriculum (Option 5) in Fruit and Vegetable Processing (Conforming to Curriculum B in Agriculture).

	Credits
Quantitative Analysis, Chem. 211, 212, 213	12
Organic Chemistry, Chem. 421, 422, 423	15
Calculus, Math 211, 212, 313 or 201, 202, 203	9 or 12
General Physics, Phys. 211, 212, 213 or 201, 202, 203	12 or 15
General Bacteriology, Bot. 412	4
Advanced Bacteriology, Bot. 552	3
Dairy Engineering, Agr. 313	3
Vegetable Growing, Hort. 303	3
Fruit Growing, Hort. 331	3
Technology of Fruit and Vegetable Products, Hort. 521, 522, 523	12
Handling and Storage of Fruits and Vegetables, Hort. 562	3

POULTRY SCIENCE

Professor R. S. Dearstyne, Head of the Department

Professor E. W. Glazener
Associate Professors J. W. Kelly, T. T. Brown, B. F. Cox, C. H. Hill
Assistant Professor F. W. Cook
Instructors W. L. Blow, G. A. Martin

Curriculum.—The curriculum in Poultry Science has as its objectives training in the fundamental principles of general poultry husbandry and related scientific fields and the application of these principles to poultry biology, judging, preparation and grading of poultry products, hatchery and plant management, breeding, nutrition, and diseases.

Opportunities.—Graduates of the Poultry Department hold positions as State and County Extension Poultry Specialists; poultry farm operators and managers; poultry and egg grading inspectors; field service men for hatcheries, feed manufacturers, commercial concerns allied to poultry, farm cooperatives; and as teachers and research personnel.

Purposes and Scope.—The Poultry Department as a major division of the School of Agriculture serves North Carolina through teaching, research, and extension. Its research personnel embraces the field of avian genetics, sero-bacteriology, immunology, histology, pathology, hematology, and nutrition. It has three poultry farm units (chickens and turkeys) near the campus and two Experiment Station farms in the eastern and western parts of the State. The staff devotes its full time to poultry problems of the student, the poultryman, and the industry. It serves a chicken and turkey farm industry of nearly 25,000,000 broilers, 10,000,000 layers and 750,000 turkeys valued at approximately $90,000,000. It cooperates with the commercial concerns allied with poultry.

Scott Hall, Poultry Science Building.—The Poultry Department and Poultry Extension occupy the new building completed and equipped in 1952-53.

Instruction.—In addition to the offices, classrooms, assembly room, and Extension Demonstration Room there are laboratories and bird rooms equipped for student instruction in general poultry, hatchery management, preparation and grading of poultry products, nutrition, genetics, anatomy and physiology, judging, sero-bacteriology, immunology, diseases, and egg and meat quality and processing.

Equipment.—The laboratories are well equipped for teaching and research. Cold storage facilities provide rooms for chilling, freezing and storage of poultry meat and eggs. Equipment for demonstrating the processing of birds for current marketing and storage is installed in the Processing Laboratory. A 10,000 egg incubator, brooders, growing and laying batteries are available for instruction and research.

Disease Diagnostic Laboratory.—Serves directly and indirectly the poultrymen of the State. Approximately 57,000 birds have been autopsied since 1923; 4,000 are now autopsied annually. More than 1,300 poultrymen are reached each year by correspondence and 500-600 receive personal attention in the laboratory. The birds received serve as excellent material for teaching, for laboratory material in the courses in anatomy and poultry diseases, and for investigational work in avian bacteriology, sero-bacteriology, anatomy, histology, pathology, hematology and parasitology.

Central Poultry Plant.—This plant of 20 acres located about 2 miles from the campus consists of two chicken farm units and one turkey farm unit.

Chicken Farm Units.—One unit has range facilities for raising potential breeding stock and facilities for housing birds used in teaching general poultry and poultry judging. The second unit primarily for poultry breeding research consists of four laying units and a breeder unit with a capacity of approximately 2,600 layers. The breeding house has 32 single mating pens and the brooder house has a capacity of nearly 5,000 chicks. The large central brick building has adequate incubator facilities, chick brooder batteries, egg holding room, and an egg grading room. A large well equipped room on the second floor of the building is used for student lecture and laboratory classes and for public agricultural meetings and short courses.

Turkey Farm Unit.—This farm of twenty-five acres consists of two laying test houses for 400-500 bronze turkey hens, four houses each with two mating pens, and two brooder houses. There are space and adequate facilities for incubation and feed mixing. Range facilities and confinement rearing shelters are available. These three farm units provide abundant material for teaching and demonstrating principles of poultry management, breeding, judging, nutrition, and sanitation.

Research.—Laboratories are now well equipped to pursue a substantial research program in genetics, nutrition, egg and meat quality and processing, sero-bacteriology, histology, pathology and hematology.

Department Library.—The student library and reading room provides access to popular poultry publications and to bound volumes of scientific journals.

Poultry Science Club.—The purposes of the club are to bring together those students and staff members of the campus who are interested in poultry, to have programs of mutual interest, and to take part in the activities of the Poultry Department and the School of Agriculture.

Poultry Judging Teams.—Students are trained in poultry judging by the staff. Qualified students who make the judging teams annually go to the Southern Intercollegiate Poultry Judging Contest and to the National Intercollegiate Poultry Judging Contest in Chicago to compete with teams from other colleges. The trophies won by State College Teams are on display in the trophy case in Scott Hall.

UNDERGRADUATE STUDY

Curriculum A

Students wishing to major in Poultry Science should elect the General Curriculum in Agriculture, Curriculum A outlined on page 76. In addition to the specific courses outlined on page 77 for juniors and seniors the following courses are required of poultry majors:

COURSES	Credits
Business Law—Econ. 407	3
Business Correspondence—Eng. 211	3
Animal Physiology—Zool. 301 and Genetics—Gen. 411	10
General Bacteriology—Bot. 412	4
Poultry Judging—Poul. 301 and Poultry Anatomy and Physiology—Poul. 311	9
Preparation and Grading of Poultry Products—Poul. 332	3
Turkey Production—Poul. 342 and Hatchery Management—Poul. 303	7
Poultry Seminar—Poul. 423, 3 terms	3
Poultry Diseases—Poul. 401, 402	8
Poultry Breeding—Poul. 520 and Poultry Nutrition—Poul. 521	8
Commercial Poultry Plant Management—Poul. 412	3

A program of study leading to the degree of B.S. in Poultry Science will be developed from Curriculum A and the courses listed above by a committee of the Poultry Department for those college graduates who wish a curriculum for an adequate background and broad training in poultry.

Curriculum B

Students who are interested in the more technical phases of poultry and are looking forward toward graduate study in preparation for research and teaching positions should elect the Specialized Curriculum in Agriculture (B) outlined on page 77. The program for the junior and senior years for students majoring in Poultry Science will be developed in each instance by a committee of the Poultry Department.

Graduate Study

(See Page 179)

An advanced student interested in investigation and research and who has the proper prerequisites may pursue a course of study offered by the Poultry Department leading to the degree of M.S. in Poultry Science. For general regulations of the Graduate School the announcement of the Graduate School should be consulted. For the graduate courses offered by the Poultry Department see pages 322-324. A graduate committee will develop the graduate program of the student in each instance.

RURAL SOCIOLOGY

Professor C. Horace Hamilton, Head of the Department

Associate Professor Selz C. Mayo; Assistant Professor Sheldon G. Lowry
Instructor J. W. Green

Objectives.—The principal objectives of this department are: (1) to give all students an appreciation of the human and social values in agriculture and rural life; (2) to give the future farmer and rural citizens an understanding of the social problems of the rural community; (3) to train rural leaders in methods of group organization and social control; (4) to train a few exceptional young men in rural sociological research and extension methods.

Relation to Other Departments.—The Department of Rural Sociology is closely related to and dependent upon Social Science Departments in the College and in the Consolidated University. Students specializing in rural sociology will be expected to take courses in such departments as: Sociology, Psychology, Statistics, Agricultural Economics, History, and Political Science. The Department of Rural Sociology functions also in a service capacity to Agricultural Departments and other rural agencies. Students taking courses in technical agriculture may take one or more courses in Rural Sociology as an elective Social Science.

Laboratory and Research Facilities.—The Department of Rural Sociology is constantly engaged in statistical and sociological studies of rural population, rural standards of living, rural communities, and related problems. Funds, laboratory equipment, and other facilities for this work are provided by the Agricultural Experiment Station and are available for the use of advanced students specializing in the field of Rural Sociology.

In a broader sense, the entire State is a laboratory for the study of rural social problems. Field trips and extended surveys may be carried out by advanced students during the summer months.

New Opportunities.—The field of rural social work offers new opportunities for agricultural graduates who have specialized in rural sociology. There is a great need now for men particularly, to fill administrative positions in all kinds of social security and welfare organizations, public and private. The rural sociology curriculum is designed to prepare agricultural college graduates for advanced professional training in social work and administration.

Curricula.—In the Department of Rural Sociology students may major in either the General Curriculum in Agriculture (page 76) or the Specialized Curriculum in Agriculture (page 77).

STATISTICS

Professor J. A. Rigney, Head of the Department

Professors: R. L. Anderson, R. E. Comstock, Gertrude M. Cox, H. L. Lucas,
H. Fairfield Smith
Associate Professors: A. L. Finkner, R. J. Monroe,
H. F. Robinson, R. J. Hader
Assistant Professors: F. E. McVay, F. J. Verlinden
Instructors: Sarah Carroll, Mary Ellen Harris
Assistant Statisticians: P. P. Crump, T. W. Horner
Resident Collaborator: C. B. Carney

The extension of the use of statistics to more and more diverse fields of application has steadily increased since the first World War. Industry is placing increasing reliance on statistical methods to control the quality of goods in the process of manufacture and to determine the acceptability of goods already produced. Statistical procedures are becoming basic tools for making weather forecasts, crop and livestock estimates, business trend predictions, opinion polls and the like. Furthermore, all fields of research are fast realizing the importance of statistical aids in planning, analyzing and interpreting the results of investigations.

Organization—The Department of Statistics is a part of the Institute of Statistics. It provides instruction, consultation and computational service for all other departments of all schools in the college. The Agricultural Experiment Station receives assistance in designing experiments, analyzing, and interpreting results. Governmental agencies and other institutions use the facilities of the Department. The range and quality of data handled furnish an excellent background for training students in the use of statistical procedures in such fields as the plant, animal and social sciences and industrial engineering.

Laboratory.—A laboratory equipped with the best facilities available is maintained. Calculating machines, comptometers and International Business Machines are used constantly. Students have an opportunity to get actual experience in the use of these machines and to learn the types of data for which each is best suited.

Curriculum.—The curriculum in Statistics is based on the Specialized Curriculum in Agriculture as shown on page 77 and provides for options in Plant Science, Animal Science, Agricultural Economics, and Rural Sociology.

THE AGRICULTURAL EXPERIMENT STATION

J. H. Hilton, Dean of Agriculture

R. W. Cummings, Director of Research

Establishment.—The Agricultural Experiment Station was established in accordance with an Act of the General Assembly of 1877. Its progress has been enhanced by different Acts of Congress giving to the Station additional funds in 1887, 1906, 1925, 1935 and 1946. These are known as the Hatch, the Adams, the Purnell, the Bankhead-Jones, and the Research and Marketing acts, respectively. The General Assembly has allocated to the Station annually certain funds from the general fund.

Purpose.—The purpose of the Agricultural Experiment Station is to study the basic laws of nature underlying the agricultural enterprises and to develop methods for economic production of the highest grades of livestock, poultry, and plants on the many soil types and varied conditions existing throughout the commonwealth; to study methods for the control of parasitic insects and organisms that cause serious economic losses of animals, poultry, and plants; to find and develop varieties of animals, poultry, and plants, new, and resistant to diseases and the changeable conditions prevailing in this State; and to perfect better marketing for all agricultural products.

Work.—The staff of the Agricultural Experiment Station conducts experiments throughout the State on areas owned by farmers, on nineteen strategically located experimental farms, on farms rented for short periods, and in the greenhouses and laboratories of the College.

Research.—The agricultural research aims, through the discovery of new facts, to improve the well-being of farmers throughout the State; to strengthen the regulatory work of the State Department of Agriculture; to develop new and necessary facts for the teaching of sound agricultural principles by vocational agricultural instructors, agricultural extension agents, and agricultural instructors in the College.

Experts.—The Agricultural Experiment Station staff brings to the College many experts, whose teachings in many specialized fields of agriculture assure the maintenance of curricula of high standards. It contributes much to the advanced training of students who are destined to become the leaders, teachers, and investigators so necessary in the maintenance of agriculture on sound and economic planes.

Publications.—The Agricultural Experiment Station publishes many bulletins and scientific papers on results of research conducted by the staff. These are free and sent upon request of anyone in the State.

Problems.—The staff diagnoses and interprets many problems for the farmers of this State; holds council with farmers and others interested in the agricultural industry; discusses farming procedures over the radio; and writes many letters on the more specific problems of agriculture at the request of farmers, members of garden clubs, and of fertilizer, fungicide, and insecticide manufacturers. It takes part in many of the administrative functions of the College.

COOPERATIVE AGRICULTURAL EXTENSION WORK

James H. Hilton, Dean of Agriculture
I. O. Schaub, Director Emeritus of Extension
David S. Weaver, Director of Extension
John W. Goodman, Assistant Director of Extension
Robert W. Shoffner, Assistant Director of Extension
Ruth Current, State Home Demonstration Agent
Verna Stanton, Assistant State Home Demonstration Agent

Support.—The Agricultural Extension Service of State College is conducted coöperatively with the United States Department of Agriculture and the one hundred counties of the State. The work is supported by Federal funds derived from the Smith-Lever Act of 1914, the Capper-Ketcham Act of 1928, the Bankhead-Jones Act of 1935, the Bankhead-Flannagan Act of 1945, and from State appropriations and county appropriations. The Federal and State appropriations are used to maintain an administrative and specialist staff, and to supplement salaries and travel expenses of county Extension agents, located at the county seat of each county in the state.

Purpose.—The purpose of the Extension Service is to teach by demonstration and otherwise. In carrying out this purpose, the College maintains a staff of trained specialists, a system of county agents and assistant agents, both men and women. Instruction is given at group meetings by method and result demonstrations, and by the written word, by training leaders, and through organized effort with clubs of men, women, and young people. In all of these activities, the plan is to carry the rural people of North Carolina the latest and best information obtainable for building a more prosperous and satisfying life on the farm. The Extension Service holds a number of short courses, both on the College campus and elsewhere over the State, that the greatest number of rural leaders may be trained for building better homes and better farms, in the use of more efficient practices, thus creating a more satisfying way of life.

SCHOOL OF DESIGN

Henry L. Kamphoefner, Dean of the School of Design

The School of Design offers professional instruction to the undergraduate in Architecture and Landscape Architecture. A graduate program in both fields is being projected for the near future.

A third Department, of Products Design, is being planned which will concern itself with problems of form and aesthetics as related to the design and fabrication of industrial products. The new department will actively collaborate with a number of existing departments on the campus which are now engaged in management and production.

The School of Design is devoted to the development of a native art form in the practical and useful arts to meet the needs and conditions of the southern regions. The opportunities for the school's graduates to contribute to the solution of problems in building design, site planning, and general construction are without limit, as the school's Department of Architecture is the only one accredited in the South's most progressive state, and the Department of Landscape Architecture one of two accredited in the region.

In its approach to the problems of design, the School of Design considers regionalism as a factor of primary importance in the development of contemporary civilization. Diversified regional features of the South are used as illustrations of similar problems elsewhere, with the logical diversity of resulting form as an ultimate goal. The standards of professional ethics represented by the school include the profound treatment of the human factors involved in the creation of an architectural form along with its allegiance to structure, material, landscape of which it becomes an integral part, climate in which it provides a shelter. Within the broad current of the contemporary movement in architecture, the school attempts to point to diversity of solutions, creating a method of approach which sponsors further individual study and search for personal expression of each graduating student.

Faculty

The eminence of the teaching faculty in the School of Design is widely recognized. The majority of the staff can claim national, and international, prominence with wide reputations in their professional fields. Nearly all of the faculty are practicing architects or landscape architects who supplement their contributions to the profession by a vigorous though limited practice in addition to their primary interest as teachers. By constant touch with the real problems of architecture and planning, the staff exert a dynamic stimulus to their capabilities as teachers. Each year a group of lecturers and authorities on architecture and planning are invited to the school to supplement the teaching of the permanent staff.

The School of Design is part of a great scientific institute and can make available to its students competent teachers in other fundamental disciplines needed for the full development of the architect. The young architect learns his mathematics from a mathematician, and his engineering from engineers. The school works in close collaboration with its companion School of Engineering and shares the accomplished faculty of that school in the development of the scientific and engineering work necessary to the modern architect's understanding and interest in the expanding techniques of contemporary society.

Curricula

This catalog issue contains the curricula in Architecture and Landscape Architecture, which were effective in all five years of both curricula beginning in September 1952.

Admission and Advanced Standing

Regulations for admission and for advanced standing are stated under information for applicants.

Physical Facilities

The administrative offices of the school and two Departments of Architecture and Landscape Architecture are now located on the top floor of Daniels Hall. The school also uses three specially converted army barracks, nos. 18, 19 and 22, and a portion of the first floor of Patterson Hall. Upon completion of the New State College Library, the School of Design will convert and add to the D. H. Hill Library for its own use and bring all the functions of the school under one roof, probably by the fall of 1955.

Degrees

The five year curricula offer courses of study leading to the Bachelor of Architecture and the Bachelor of Landscape Architecture. The four-year program in Architectural Engineering was discontinued effective September 1948. The last class in Architectural Engineering graduated in June of 1951.

ARCHITECTURE*

Visiting Professor Eduardo F. Catalano, Acting Head of Department
Professor Ross Shumaker
Associate Professors William L. Baumgarten, James W. Fitzgibbon,
Duncan R. Stuart, Manuel Bromberg, George Matsumoto,
Roy Gussow, Horacio Caminos
Assistant Professor Cecil D. Elliott
Instructors Leslie J. Laskey, Kenneth McC. Scott, Louis Tavelli,
Richard P. Leaman, Ray C. Howard
Librarian, Mrs. James A. Lyons

Education in architecture at the School of Design offers a program of study intended to make the student in architecture a successful member of his profession after practical experience has been supplemented.

A well integrated pattern of courses aims at the understanding of individual and public building requirements for urban and rural communities. This includes the technical as well as the broad economic and social aspects of modern society.

Two major groups of courses form the backbone of the curriculum:

(1) Courses in the History and Philosophy of Architecture and related arts. Analysis of form in art as the expression of the social phenomena of different periods continues through all the years of study. Lectures are supplemented with research conducted by the students and related to design problems.

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* The curriculum in Architectural Engineering was discontinued effective September 1948.

(2) The Design Courses which are the main source of the professional technique of expression and, therefore, are the most important part of the curriculum, tying in a logical sequence all the years of studies. These courses provide a platform of collaboration between different subjects in the school and different departments of the College. The schools such as Engineering and Textiles, the Departments of Ceramics and Sociology; outside agencies such as local planning commissions, etc., participate in the design problems. Design is considered as a synthesis of theoretical information acquired in all the other courses and in a more advanced stage is organized similarly to an architectural office.

The courses are divided into three study periods:

(1) The freshman and sophomore courses cover the general initiation into problems of composition in the visual arts and, later, a study of space, sheltering the main human functions of dwelling, working and recreation. This period is treated as a base allowing for a further choice of other than strictly architectural training in the field of Design. Collaboration with the Textile and Ceramic Departments takes place here on problems related to habitable space.

(2) The third and fourth years of study are the beginning and the development of creative work in the professional sense. This is a period of strongly pronounced collaboration of various sources, including group problems for students, the interchange of faculty members, seminars with visiting critics and lecturers, etc. Research in social and planning fields precedes most of the problems. Constant collaboration with the Engineering Department of the College and the Department of City and Regional Planning in Chapel Hill is a pronounced feature of this study period.

(3) The fifth year: A final synthesis of the studies.

CURRICULUM IN ARCHITECTURE

First Year

	Terms and Credits		
COURSES	F	W	S
Des. 101, 102, 103—Design I, II, III	5	5	5
Eng. 101, 102, 103—Composition	3	3	3
Math. 111, 112, 123—Algebra, Trigonometry, Analytical Geometry	4	4	4
S.S. 101, 102, 103—Contemporary Civilization	3	3	3
*Mil. Sci. 101, 102, 103 or Air Sci. 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education & Hygiene	1	1	1
	18	18	18

Sophomore Year

	F	W	S
C.E. 229—Analysis of Framed Structures	0	0	3
C.E. 323—Materials Testing Laboratory	0	0	1
Des. 201, 202, 203—Design IV, V, VI	5	5	5
Des. 211, 212, 213—Descriptive Drawing I, II, III	2	2	2
Des. 221, 222, 223—Structures, Topographics, Materials of Construction	2	2	3
E.M. 211, 222—Applied Statics, Applied Strength of Materials	3	3	0
Math. 211—Calculus	3	0	0
S.S. 113—Contemporary Science and Sociology	0	3	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	18	18	17

Summer Requirement: Regional Research Project (two weeks)

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* Or equivalent in the Humanities or Social Sciences.

Junior Year

COURSES	Terms and Credits F	W	S
Arch. 301, 302, 303—Architectural Design I, II, III	6	6	6
C.E. 325, 326, 327—Design of Structural Elements, Elementary Indeterminate Structures, Elements Reinforced Concrete Design	3	3	3
C.E. 365—Sanitary Equipment for Buildings	3	0	0
Des. 311, 312, 313—Descriptive Drawing IV, V, VI	2	2	2
Des. 331, 332, 333—History of Architecture I, II, III	3	3	3
E.E. 343a—Electrical Equipment of Buildings	0	3	0
M.E. 184—Elements of Heating & Air Conditioning	0	0	3
Electives or Advanced Military Science or Air Science	3	3	3
	20	20	20

Summer Requirement: Professional Employment (eight weeks)

Senior Year

	F	W	S
Arch. 401, 402, 403—Architectural Design IV, V, VI	6	6	6
C.E. 335, 336, 337—Steel Design, Timber Design, Independent Designs	2	2	2
Des. 232, 233—History of Landscape Architecture I, II	0	3	3
Des. 411, 412, 413—Descriptive Drawing VII, VIII, IX	2	2	2
Des. 421, 422, 423—Office Procedure I, II, III	2	2	2
Des. 431—History of Architecture IV	3	0	0
American, English or World Literature	3	3	3
Electives or Advanced Military Science or Air Science	3	3	3
	21	21	21

Professional Year

	F	W	S
Arch. 501, 502, 503—Architectural Design VII, VIII, IX	10	10	10
C.E. 343—Foundations	3	0	0
Des. 511, 512, 513—Descriptive Drawing X, XI, XII	2	2	2
Des. 531, 532, 533—Philosophy of Design I, II, III	2	2	2
Electives	3	6	6
	20	20	20

Total credits required for the Bachelor of Architecture—290.

LANDSCAPE ARCHITECTURE

Professor Edwin G. Thurlow; Associate Professors Duncan R.
Stuart, Manuel Bromberg, and Roy Gussow; Instructors
Leslie J. Laskey, Louis Tavelli, Lewis Clarke, Ray Howard

Landscape architecture is the art of planning the human outdoor environment for convenient use and enjoyment with the preservation or creation of beauty always a primary objective.

The art is as old as civilization. Its evolution can be traced in unbroken chain from early Egypt. As a separate profession it owes its origin largely to the need for alleviating conditions created by the industrial revolution—urban overcrowding and separation from the soil, from contact with "nature" of large numbers of people.

During the middle and late 19th Century, a number of designers began to devote their time and talents exclusively to this end. The results of their efforts can be seen in the great recreation parks of New York and Brooklyn, in the parkways of Boston and Philadelphia which carry the atmosphere of the country into the heart of the city, in so-called garden cities, and in garden housing developments. Today, public highway, park, and land development authorities employ landscape architects as a necessity in sensitively planning their land. Many landscape architects, however, practice independently, making their services available to private individuals, commercial organizations, to institutions, and public agencies.

Landscape architecture is an outdoor construction profession. Unlike the builder who constructs typically with new materials brought to the site, the landscape architect must work with the surface of the land as he finds it. This he may replan or remodel to the end that it may be more efficient or more enjoyable in use. He may protect the surface against wear and water or embellish it with structures or with planting.

Since the landscape architect's work lies exposed to the weather, he must be firmly grounded in an understanding of the effects of rain and the control of runoff water. He must be familiar with the properties and appropriate uses of building materials. Because vegetation is one of the most distinctive of his design materials he must have a sound knowledge of ornamental plants and horticultural practices.

The curriculum in landscape architecture is planned to meet these needs. While emphasis throughout the course is on design in its broadest sense, training is kept in balance by courses in human behavior and in phases of graphic expression. Construction, engineering, and horticulture contribute toward achievement of a fully rounded curriculum.

One of the great advantages which the department enjoys is its geographical location. The climate is such that construction and planting activities are rarely interrupted by winter cold and are in consequence available for observation and study throughout the academic year. Botanists credit North Carolina with the most abundant variety of plant growth to be found in any state. The range from the southeastern coastal plain to the high mountains of the west is from subtropical types to those typical of southern Canada.

The college is likewise located close to the sites of great early American plantations where landscape architecture as an art first flowered in this country. While these may serve as a laboratory for the study of traditional design, so may the great monuments of contemporary design such as the TVA, the Blue Ridge Parkway, and the Great Smoky Mountains National Park be easily reached and studied from Raleigh.

The graduate in landscape architecture is equipped to provide plans for the development of land areas which are appropriate to their intended uses and which yield the greatest social and economic return. He has been trained in design to assess the maximum in usefulness and beauty inherent in a given site.

The curriculum is accredited by the American Society of Landscape Architects. Successful completion of the five-year course of study leads to the degree of Bachelor of Landscape Architecture.

The Garden Club of North Carolina offers two annual scholarships totaling $250 each to North Carolina high school graduates for the study of landscape architecture at this college.

The competition for the fellowship in landscape architecture at the American Academy in Rome (Italy) is open to students of the department and was won by graduates in 1948 and 1950.

CURRICULUM IN LANDSCAPE ARCHITECTURE

Freshman Year

COURSES	Terms and Credits F	W	S
Des. 101, 102, 103—Design I, II, III	5	5	5
Eng. 101, 102, 103—Composition	3	3	3
Math. 111, 112, 123—Algebra, Trigonometry, Analytical Geometry	4	4	4
S.S. 101, 102, 103—Contemporary Civilization	3	3	3
*Military Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education & Hygiene	1	1	1
	18	18	18

Sophomore Year

Bot. 101—General Botany	0	4	0
C.E. 208—Surveying and Mapping I	4	0	0
Des. 201, 202, 203—Design IV, V, VI	5	5	5
Des. 211, 212, 213—Descriptive Drawing I, II, III	2	2	2
Des. 221, 222, 223—Structures, Topographics, Materials of Construction	2	2	3
Des. 232, 233—History of Landscape Architecture I, II	0	3	3
E.M. 211—Applied Statics	3	0	0
Hort. 101—General Horticulture	0	0	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	19	19

Summer Requirement: Regional Research Project (two weeks)

Junior Year

Des. 311, 312, 313—Descriptive Drawing IV, V, VI	2	2	2
Des. 331, 332, 333—History of Architecture I, II, III	3	3	3
Hort. 201, 202, 203—Woody Plants	3	3	3
Hort. 213—Herbaceous Plants	0	0	3
Hort. 311—Nursery Practice	3	0	0
L.A. 322, 323—Landscape Construction I, II	0	3	3
L.A. 301, 302, 303—Landscape Design I, II, III	4	4	4
American, English, or World Literature	3	3	0
Electives or Advanced Military	3	3	3
	21	21	21

Summer Requirement: Professional Employment (eight weeks)

Senior Year

Des. 411, 412, 413—Descriptive Drawing VII, VIII, IX	2	2	2
Des. 431—History of Architecture IV	3	0	0
L.A. 401, 402, 403—Landscape Design IV, V, VI	6	6	6
L.A. 421, 422, 423—Landscape Construction III, IV, V	4	4	4
L.A. 441, 442, 443—Planting Design I, II, III	3	3	3
American or English Literature	0	3	0
Electives or Advanced Military	3	3	3
	21	21	18

Professional Year

Des. 511, 512, 513—Descriptive Drawing X, XI, XII	2	2	2
Des. 531, 532, 533—Philosophy of Design I, II, III	2	2	2
L.A. 501, 502, 503—Landscape Design VII, VIII, IX	10	10	10
Electives	5	5	4
	19	19	18

Total Credits Required for the Bachelor of Landscape Architecture—290.

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* Or equivalent credit in the Humanities or Social Sciences.

SCHOOL OF EDUCATION

J. Bryant Kirkland, Dean
†T. E. Browne, Director Emeritus

Purposes.—The School of Education at North Carolina State College is organized and equipped for the purpose of carrying out a specific function allocated to the college by the trustees of the Greater University. The particular objective of this School is to organize curricula, provide professional training and to give direction to those students who indicate an interest in becoming teachers of Vocational Agriculture, Industrial Arts, Industrial Education, Mathematics and Science, leaders of recreational programs, counselors and teacher counselors.

The State Board for Vocational Education has designated State College as the training institution for teachers of Vocational Education in the fields of agriculture, and industry, and vocational counseling. Federal funds are used to aid in the maintenance of teacher training in these fields.

Admission.—Advanced standing—Regulations for admission and for advanced standing are stated under Information for Applicants (See pages 34-36).

Curricula.—Undergraduate curricula are offered in the School of Education for the preparation of teachers of Vocational Agriculture, Industrial Arts, Industrial Education, Mathematics and Science and for leaders of programs of recreation. These curricula include courses in general education, in technical areas, in principles and methods of teaching, and in practical experience in the students' area of specialization. The courses in general education and in the technical areas are offered in cooperation with the Schools of General Studies, Agriculture, Engineering, Forestry and Textiles.

The requirements for certification to teach are set up by the State Department of Public Instruction. Each student must secure the approval of his faculty adviser in planning a program of study leading to certification as well as to graduation.

Graduate Study.—The School of Education offers work at the master's level to graduate students of recognized ability in Agricultural Education, Industrial Arts, Industrial Education, Occupational Information and Guidance and Industrial Psychology. For details see the section describing the work of each of the above departments and the statement of the State College Division of the Graduate School in this catalogue.

Requirements for Graduation.—For graduation in the School of Education, the scholastic requirement is the satisfactory completion of all the required courses in one of the curricula listed on pages 109-123. The number of honor points earned must at least equal the number of credit hours required for graduation.

Degrees.—Upon the satisfactory completion of one of the curricula in Education, a student is awarded the degree of Bachelor of Science with the name of his specialized curriculum appended: in Agricultural Education, in

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† Retired September 1, 1947.

Industrial Arts Education, in Industrial Education, in Industrial and Rural Recreation, and in Mathematics and Science Education.

The Master of Agricultural Education, Industrial Arts Education, Industrial Education, and Occupational Information and Guidance is awarded to students in Education who meet the general requirements of the Graduate School and the specific requirements of the respective departments in which graduate work is taken. Students enrolled in the above departments and in psychology who wish to acquire a broader background in their major field of interest and to conduct research in this field may earn the Master of Science degree in the department in which the work is completed.

The specific requirements for the Professional and Research degrees are listed on page 188. The residence, course of study, class work, and grade requirements are the same for both degrees. A candidate for the Master's degree (professional) is not required to possess a reading knowledge of a foreign language; a research problem may be presented in lieu of a thesis.

AGRICULTURAL EDUCATION

Professor C. C. Scarborough, Head of Department

Professor Emeritus Leon E. Cook
Professors L. O. Armstrong, J. K. Coggin, J. B. Kirkland
Associate Professor F. A. Nylund*
Assistant Professor G. B. James; Instructor C. D. Bryant

Agricultural Education is for students who plan to teach vocational agriculture. Some graduates go into other work in agriculture. Others go on in graduate work in agriculture or education. The courses which students take the first two years are about the same as in other agriculture departments. However, the main purpose of Agricultural Education is to help students become teachers of vocational agriculture.

Most of the work as a teacher will be with farm people. A student planning to teach should live on the farm. If he does not, he will secure farm experience before graduation. If a student has vocational agriculture in high school with a good supervised farming program, it will help him as a teacher.

There is now a need for teachers of vocational agriculture in North Carolina. It looks like the demand will be greater in the future. There are about 440 white teachers of vocational agriculture in 98 counties in the State. This is one of the largest programs in the United States.

Graduate Study.—The Department provides opportunities for students, fully qualified, to do graduate work in Agricultural Education. Graduate students taking majors in this field should have completed the undergraduate work in Agricultural Education or the equivalent in substance but not necessarily in credit hours.

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* On leave 1953-54.

CURRICULUM IN AGRICULTURAL EDUCATION

Freshman Year

COURSES	Terms and Credits		
	F	W	S
Agr. 101—Introduction to Agriculture	1	0	0
Agron. 101—Introduction to Agronomy	3	0	0
A.I. 101 or 102—Introductory Dairy Science or Intro. An. Husb.	0	3	0
Bot. 101, 102—General Botany	0	4	4
Eng. 101, 102. 103—Composition	3	3	3
Geol. 120—Physical Geology	0	0	4
Hort. 101—General Horticulture	0	0	3
Math. 111—Algebra	4	0	0
*Military Sci. 101, 102, 103 or Air Sci. 121, 122, 123	2	2	2
*P.E. 100—Hygiene and P.E. 101, 102, 103—Physical Education	1	1	1
Poul. 101—General Poultry	3	0	0
Zool. 101, 102—General Zoology	0	4	4
	17	17	17

Sophomore Year

COURSES	F	W	S
Agr. Engr. 211—Farm Equipment	3	0	0
Chem. 201, 202—General Inorganic Chemistry	5	5	0
**Electives			
Agriculture	3	4	0
Chem. 203—Intro. to Org. Chem. or Physics 215—General Physics	0	0	5
English	3	3	0
History and/or Political Science	3	3	3
Other	0	0	4
Military Science II or Air Science II	2	2	2
*P. E. 201, 202, 203—Physical Education	1	1	1
Rural Soc. 201—Social Problems of Rural Life	0	0	3
	20	18	18

Junior Year

COURSES	F	W	S
Agr. Engr. 311, 312—Farm Shop	0	3	3
Agron. 201—Soils	0	5	0
Agron. 301—Soil Fertility and Fertilizers	0	0	4
Econ. 301, 302—General Economics	3	3	0
Ed. 308—Visual Aids	0	0	3
Ed. 313—Organizing Programs in Vocational Agriculture	0	0	3
Ed. 344—Secondary Education	3	0	0
**Electives			
Agriculture	4	0	0
Others	3	3	3
For. 311—Principles of Farm Forestry	3	0	0
Pl. Path. 315—Plant Diseases	0	0	4
Psychol. 304—Educational Psychology	3	0	0
Psychol. 476—Psychology of Adolescence	0	3	0
	19	17	20

Senior Year

COURSES	F	W	S
Agr. Econ. 303—Farm Management I	4	0	0
Ed. 407—Methods of Teaching Vocational Agriculture	3	0	0
Ed. 411—Student Teaching in Agriculture	0	15	0
Ed. 520—Principles of Guidance	0	0	3
**Electives			
Agriculture	4	0	8
English	0	0	3
Others	3	3	3
Gen. 411—Genetics	5	0	0
Rural Soc. 321—Introduction to Social Research	0	3	0
	19	21	17

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*Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

**Electives to be selected with aid of adviser. Agriculture electives must be chosen so the student, at graduation, has the following minimum hours in each department listed:

A.I.........12 hrs. Hort.........9 hrs. Poultry......6 hrs.

Students who do not present entrance credit for U. S. History must take Hist. 121 & 122.

INDUSTRIAL ARTS EDUCATION

Professor Ivan Hostetler, Head of Department
Associate Professor, Marshall L. Schmitt

Instructor, Robert T. Troxler

Industrial Arts comprises that area of education which concerns itself with materials, processes, and products of industry. It is concerned with a study of changes made in materials to make them more useful and of the problems related to those changes. For many years, through its program of teacher education, North Carolina State College has had an important part in aiding individuals to cope with the increasingly complex problems of living in an industrial society.

The demand for competent teachers of Industrial Arts has increased year after year, and the need for Industrial Arts as an essential phase of general education at the elementary and secondary school levels is being realized by progressive school communities and leaders in education.

Purposes.—The Department of Industrial Arts is organized to aid in the education of teachers and supervisors of Industrial Arts, and to provide experiences for those individuals who desire to deal more appreciatively and effectively with problems of living in a democratic-industrial society. The successful completion of this curriculum leads to the granting of the degree of Bachelor of Science in Industrial Arts Education and the fulfillment of requirements for an A-grade certificate for teaching in this field.

The first two years of work in this curriculum emphasize work of a general and foundational nature. The junior and senior years are planned to include experiences of a specialized-professional nature. All students in their senior year will spend one full term in off-campus student teaching in public schools throughout the State. This student teaching program is a phase of the curriculum which helps to bridge the gap from student to teacher.

In addition to added faculty personnel, new facilities have been provided in the Department which include: laboratories, machines, tools, benches, classrooms, and library resources. Further increases in physical setting and equipment have been planned which will make North Carolina State College one of the leading Industrial Arts teacher-education centers in the Southeast.

Graduate Program.—Opportunities are provided for students of demonstrated interest and ability to do graduate work leading to the Master of Industrial Arts Education or Master of Science in Industrial Arts Education. (See Graduate Catalog). The faculty personnel and resources of the Greater University of North Carolina are used in planning a sequence of experiences on the graduate level to meet the individual interests and needs of persons interested in Industrial Arts Education. Persons interested in graduate work in this field are invited to write for detailed information and courses offered.

Freshman Year

	Terms and Credits		
COURSES	F	W	S
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S. History	3	3	0
I.A. 103, 104, 105—Industrial Arts Drawing	3	3	3
I.A. 106—Orientation in Industrial Arts	3	0	0
I.A. 107, 108—General Woodwork	0	3	3
Math. 111—Algebra	4	0	0
Math. 112—Trig. for Ag. and Educ. Students	0	4	0
Math. 113—Math. of Finance	0	0	4
Military Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P. E. 101, 102, 103—Physical Educ. and Hygiene	1	1	1
Pol. Science 211—American Government	0	0	3
	19	19	19

Sophomore Year

Chem. 101, 102—Gen. Inorganic Chemistry	4	4	0
Chem. 105—General Chemistry	0	0	4
Eng. 211—Business Correspondence	3	0	0
Eng. 231—Public Speaking	0	3	0
I.A. 205—Industrial Arts Design	0	3	0
I.A. 206, 207, 208—General Metalwork	3	3	3
I.A. 270—Problems in Woodwork	3	0	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
Phys. 215—General Physics	0	0	5
Psy. 200—Introductory Psychology	0	0	3
Soc. 202, 203—General Sociology	3	3	0
	19	19	18

Junior Year

Econ. 301, 302, 303—General Economics	3	3	3
Ed. 308—Visual Aids	0	0	3
Ed. 344—Secondary Education	3	0	0
Ed. 422—Methods of Teach. Ind. Subjects	0	0	3
Ed. 433—Fld. Work in Secondary Education	0	3	0
Eng.—Elective	0	3	0
I.A. 306—Graphic Arts	3	0	0
I.A. 307, 308—General Electricity	0	3	0
Psy. 304—Educational Psychology	3	0	0
Psy. 476—Psychology of Adolescence	0	3	0
**Electives in Related Technical and Shop Courses	3	0	3
**Electives	3	3	3
	18	18	15

Senior Year

Ed. 444—Student Teaching in Industrial Subjects	15	0	0
Ed. 520—Principles of Guidance	0	3	0
Ed. 524—Occupational Studies	0	0	3
Ed. 582—Curriculum Problems in Ind. Arts	0	3	0
Ed. 583—Instructional Aids and Devices	0	3	0
Ed. 584—School Shop Plan. and Equip. Sel.	0	0	3
I.A. 420—Tools and Materials	0	0	3
I.A. 460—The General Shop	0	3	0
**Electives in Related Technical and Shop Courses	0	3	6
**Electives	3	3	3
	18	18	18

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** Electives to be selected with aid of adviser to meet special needs of individual students.

INDUSTRIAL EDUCATION

Associate Professor Louis B. Beres, Head of Department

Object—The industrial development of a state depends in a large degree upon its available supply of skilled labor. During the past two decades, North Carolina has come to the fore as one of the leading industrial centers of the Southeastern United States. Through efficient and effective industrial training the public schools can meet their responsibility in developing skilled workers and technical personnel necessary to man established industries as well as to prepare workers for new industries. Schools, in order to meet this challenge, must be staffed with competent teachers. The curriculum in Industrial Education is designed for the purpose of training occupationally competent persons for a professional career in this field of service. The four-year curriculum is planned to provide the student with a broad cultural and professional background to parallel his occupational experience.

Positions for Graduates.—The student who completes this course will be prepared to teach in the all-day trade schools, area vocational schools, the part-time, or evening vocational classes, such as are supported by State and Federal funds for vocational education. Graduates will also have met the requirements for certification as teachers of Industrial Arts. At the present time, little difficulty should be encountered by the successful candidates in attaining positions after graduation, and salaries compare favorably with those in other professional fields.

Trade Experience Required.—Candidates for degrees must have had at least two years of succesful trade experience in the trade they wish to teach. Successful completion of this course leads to the degree of Bachelor of Science in Industrial Education. Students desiring this degree may enter with or without having the required practical experience. If the student does not have any trade experience when he enters, he must meet this requirement before getting the degree, either by working parts of the school year or by completing the work experience after completing the required resident courses.

This Department is designated as the official Teacher Training Agency in Industrial Education for the State Department of Education. The head of the Department serves as itinerant teacher-trainer for all phases of industrial education, and for the preparation of prospective teachers in residence.

CURRICULUM IN INDUSTRIAL EDUCATION

Freshman Year

COURSES	Terms and Credits F	W	S
Eng. 101, 102, 103—Composition	3	3	3
Hist. 101, 102, 103—Economic History	3	3	3
I.A.—103, 104, 105—Industrial Arts Drawing	3	3	3
I.A.—106—Orientation in Industrial Arts	3	0	0
Math. 111—Algebra	4	0	0
Math. 112—Trigonometry	0	4	0
Math. 113—Mathematics of Finance	0	0	4
*Mil. Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education and Hygiene	1	1	1
Psych. 200—Intro. to Psychology	0	3	0
Soc. 202—General Sociology	0	0	3
	19	19	19

Sophomore Year

Chem. 101, 102—Gen. Inorganic Chem.	4	4	0
Econ. 301, 302, 303—General Economics	3	3	3
Eng. 211—Business Correspondence	3	0	0
I.A. 107, 108—General Woodwork	0	3	3
I.A. 205—Industrial Arts Design	3	0	0
I.E. 204—Survey of Engineering & Ind. Processes	0	3	0
I.E. 210—Safety Engineering	0	0	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
Phys. 215—General Physics	0	0	5
Pol. Science 211—American Government	3	0	0
Psych. 304—Educational Psychology	0	3	0
Tex. 217—Survey of Textile Industries	0	0	3
	19	19	20

Junior Year

Econ. 312—Accounting for Engineers	0	3	0
Ed. 308—Visual Aids	0	3	0
Ed. 344—Secondary Education	3	0	0
Ed. 422—Methods of Teaching Industrial Subjects	0	0	3
Ed. 433—Field Work in Secondary Education	0	3	0
Ed. 525—Trade Analysis and Course Construction	0	0	3
Eng. 215—Prin. of News and Article Writing	3	0	0
Eng. 231—Public Speaking	3	0	0
I.A. 206, 207, 208—General Metalwork	3	3	3
Psych. 476—Psychology of Adolescence	0	0	3
**Electives	7	7	7
	19	19	19

Senior Year

Ed. 444—Student Teaching in Industrial Subjects	15	0	0
Ed. 516—Community Occupational Surveys	0	3	0
Ed. 520—Principles of Guidance	0	3	0
Ed. 524—Occupational Studies	0	0	3
Ed. 527—Philosophy of Vocational Education	0	3	0
Ed. 584—School Shop Planning & Equip. Selection	0	0	3
Psych. 535—Tests and Measurements	0	0	3
Rec. 312—Prin. of First Aid and Safety	0	3	0
**Electives	4	6	10
	19	18	19

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** Electives to be selected with aid of adviser to meet special needs of individual students.

INDUSTRIAL AND RURAL RECREATION

Professor Thomas I. Hines, Head of Department

Associate Professor Latham L. Miller
Assistant Professor Charles C. Stott
Instructor Albert Crawford

Industrial recreation is a program of organized leisure time activities promoted and conducted by an industrial unit for the welfare of its employees and their families. Rural recreation is a similar program sponsored by an agency serving a rural area. Many industries, communities, and agencies (public and private) furnish elaborate recreation facilities. The demand for trained recreation leadership has increased with great strides in recent years. This demand exceeds by far the supply of qualified leadership to be furnished by our colleges and universities. North Carolina State College is fulfilling its obligations to North Carolina by providing a Curriculum of Industrial and Rural Recreation whereby qualified leadership is made available to industrial units and communities of North Carolina.

Purposes.—The Curriculum of Industrial and Rural Recreation is provided to equip the student with the necessary essentials demanded of a recreation executive who must originate, organize, promote, and administer a comprehensive program of recreation. It makes available sufficient elective courses to meet the student's needs and satisfy his desire to receive training related to recreation; thereby the student increases his possibilities of employment in fields closely allied with industrial and rural recreation.

The first two years of work in this curriculum includes studies of a general and foundational nature coupled with orientation and introductory courses related to industrial and rural recreation. The junior and senior years are planned to include experiences of a specialized professional nature.

In addition to faculty, facilities have been provided to make the curriculum function efficiently. Further increases in physical setting and equipment are planned which will give North Carolina State College the opportunity to acquire and maintain a leading role in the training of qualified leaders of industrial and rural recreation and its associated fields.

CURRICULUM IN INDUSTRIAL AND RURAL RECREATION

Freshman Year

COURSES	Terms and Credits F	W	S
Bot. 101—General Botany	4	0	0
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S. History	3	3	0
Math. 111, 112, 113—Algebra, Trigonometry, Math of Finance	4	4	4
*Mil. Sci. 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education and Hygiene	1	1	1
Pol. Science 211—American Government	0	0	3
Rec. 101, 103, 102—Intro. To Phy. Ed., Leadership in Recreation, Gym & Stunts	3	3	3
Zool. 101, 102—Gen. Zoology	0	4	4
	20	20	20

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Sophomore Year

	Terms and Courses		
COURSES	F	W	S
Agr. Econ. 221—Sur. of Agr. Industries	3	0	0
Econ. 301, 302, 303—Gen. Economics	3	3	3
Eng. 215, 211, 231—Prin. of News Writing, Bus. Corres., Pub. Speak	3	3	3
Geol. 120—Phys. Geology	4	0	0
I.E. 204—Sur. of Eng. & Ind. Processes	0	3	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
Rec. 201—Games of Low Organization	0	0	3
Rec. 206, 202—Rec. Fac. & Equip., Aquatic Sports	0	3	3
Soc. 202, 203—General Sociology	3	3	0
Tex. 217—Sur. of Textile Industries	0	0	3
Zool. 213—Human Physiology	0	0	3
	19	18	21

Junior Year

	F	W	S
Econ. 425, 426, 433, Industrial Management, Personnel Management	3	3	3
I. A. 314, Recreation Arts and Crafts	0	0	3
Psychol. 200, 304, 490, Intro. to Psy., Educational Psy. Social Psy.	3	3	3
Rec. 301, Principles and Organization of Physical Education	0	3	0
Rec. 302, Introduction to Community and Industrial Recreation	3	0	0
Rec. 303, Dual and Single Games	3	0	0
Rec. 305, 306, Group Games of High Organization	0	3	3
Rec. 310, Social Recreation	0	0	3
Rec. 311, Camp Organization and Leadership	3	0	0
Rec. 405, Recreation Dramatics and Music	0	3	0
Soc. 301, Human Behavior	3	0	0
Electives	3	3	3
Total Hours	21	18	18

Senior Year

	F	W	S
Ed. 308, Visual Aids	3	0	0
Psychol. 302, Psychology of Personality	0	3	0
Rec. 307, Personal and Community Hygiene	0	3	0
Rec. 401, Principles and Practices of Industrial Recreation	3	0	0
Rec. 402, Organization and Administration of Rec. Activities	0	3	0
Rec. 403, Principles of First Aid and Safety	3	0	0
Rec. 470, Supervised Practice in Recreation	0	0	15
Soc. 501, Leadership	3	0	0
Electives	6	6	3
Total Hours	18	15	18

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Field Work: Evidence of at least four months of satisfactory employment in the practice of his profession is required from each candidate for graduation. Such work may include six weeks' work in connection with the ROTC summer training program.

MATHEMATICS AND SCIENCE EDUCATION

The program for the training of Teachers of Mathematics and Science at State College was re-activated in September, 1949. The action of the Executive Committee of the Board of Trustees in re-allocating this function to the School of Education is in accord with the recommendations of the State Education Commission.

Curricula are offered for students who wish to become Teachers of Mathematics, Science, or Mathematics and Science. The Departments of Mathematics, Chemistry, Physics, Botany, Zoology, and Geology cooperate in offering the subject matter courses needed by the students in their areas of specialization. The professional courses will be taught by members of the School of Education faculty.

The satisfactory completion of the curriculum in which a student enrolls will enable him to meet the certification requirements for teaching in that subject matter area in the public schools of North Carolina.

CURRICULUM IN MATHEMATICS EDUCATION

Freshman Year

	Terms and Credits		
COURSES	F	W	S
Chem. 101, 102, 105—Gen. Inorg. Chemistry	4	4	4
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S. History	3	3	0
Pol. Science 211—American Government	0	0	3
Math. 111, 112, 123—Algebra, Trig., Analy. Geom.	4	4	4
*Mil. Sci. 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—P.E. and Hygiene	1	1	1
	17	17	17

Sophomore Year

	F	W	S
Ed. 203—Introduction to Teaching	3	0	0
I.A. 103, 104—Industrial Arts Drawing	3	3	0
Math. 113—Mathematics of Finance	4	0	0
Math. 211, 212—Calculus A, B	0	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
Physics 211, 212, 213—General Physics	4	4	4
Psy. 200—Intro. to Psychology	0	0	3
**Electives	3	6	3
Eng.—Elective	0	0	3
	20	19	19

Junior Year

	F	W	S
C.E. 203—Surveying or Physics 223—Astron. — Astrophysics	0	0	3
Econ. 301, 302, 303—General Economics	3	3	3
Ed. 308, 344—Visual Aids, Secondary Education	0	3	3
Math. 313—Calculus C	3	0	0
Psy. 304—Educational Psychology	3	0	0
Psy. 476—Psychology of Adolescence	0	3	0
Soc.—Elective	0	0	3
**Electives	6	6	6
Eng.—Elective	3	3	0
	18	18	18

Senior Year

	F	W	S
Ed. 470—Methods of Teaching Mathematics	5	0	0
Ed. 471—Student Teaching in Mathematics	0	15	0
Ed. 520—Principles of Guidance	0	0	3
**Electives	12	3	12
Math. 533—History of Mathematics	0	0	3
	17	18	18

CURRICULUM IN SCIENCE EDUCATION

Freshman Year

	Terms and Credits		
COURSES	F	W	S
Chem. 101, 102, 105—Gen. Inorganic Chemistry	4	4	4
Eng. 101, 102, 103—Composition	3	3	3
Hist. 121, 122—U. S. History, Pol. Sci. 211—American Government	3	3	3
Math. 111, 112, 123—Algebra, Trig., Analytical Geom.	4	4	4
*Mil. Sci. 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—P.E. & Hygiene	1	1	1
	17	17	17

Sophomore Year

	F	W	S
Chem. 203—Intro. to Org. Chem.	0	0	5
Ed. 203—Intro. to Teaching	3	0	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1

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** Electives: A minimum of nine hours to be in field of Mathematics, six in Science or Mathematics. All electives must be selected with the approval of the adviser.

COURSES	Terms and Courses		
(Sophomore Year—Continued)	F	W	S
Physics 211, 212, 213—General Physics	4	4	4
Psy. 200—Intro. to Psychology	0	0	3
Zool. 101, 102—General Zoology	4	4	0
Zool. 113—Human Physiology	0	0	3
**Elective	3	3	0
Eng.—Elective	0	3	0
	17	17	18

Junior Year

	F	W	S
Bot. 101, 102—General Botany	4	4	0
Econ. 301, 302, 303—General Economics	3	3	3
Ed. 308, 344—Visual Aids, Secondary Education	0	3	3
Ent. 302—Economic Entomology	4	0	0
Geol. 120—Physical Geology	0	0	4
Psy. 304—Educational Psychology	3	0	0
Psy. 476—Psy. of Adolescence	0	3	0
Soc.—Elective	0	0	3
**Elective	6	3	7
Eng.—Elective	0	3	0
	20	19	20

Senior Year

	F	W	S
Bot. 412—Gen. Bacteriology	4	0	0
Ed. 475—Methods of Teaching Sc.	5	0	0
Ed. 476—Student Teaching in Science	0	15	0
Ed. 520—Principles of Guidance	0	0	3
**Electives	9	3	12
English—Elective	0	0	3
	18	18	18

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** Electives must be selected with approval of adviser.

OCCUPATIONAL INFORMATION AND GUIDANCE

Professor Roy N. Anderson, Head of Department
Assistant Professor, Elias L. Tolbert

Special facilities are provided in the School of Education for mature students and persons who have had teaching or personnel experience and hold a Bachlor's Degree to enroll for courses leading to a Master's Degree in Occupational Information and Guidance. Advanced courses in education, economics, psychology and sociology will be selected according to the individual needs of students so as to prepare them for competent leadership in guidance and counseling techniques. In addition to the Master's Degree the courses are so designed as to meet the requirements for State Counselors' certificates.

PSYCHOLOGY

Professor Dannie J. Moffie, Head of Department
Professor Key L. Barkley
Visiting Professor, William McGehee
Associate Professor Harold M. Corter
Assistant Professors J. Clyde Johnson, Charles Kelley
Michael Caffey, Paul Rust, Allen Solem

The Department of Psychology, in view of its intimate relation to the problems of Teacher Education, is incorporated administratively in the

School of Education; at the same time it functions instructionally throughout the School of General Studies and the professional Schools.

The primary objectives of this department are: (1) to provide students in general with an appreciation and understanding of human behavior, (2) to provide students in the various technological curricula with specialized instruction in applied, industrial, and social psychology, (3) to provide students in education with general principles of instruction, learning and personality development, and (4) to provide undergraduate and graduate instruction in psychology.

The facilities and staff of the Department are adequate to offer graduate instruction in psychology. The Department gives a Master of Science Degree in Industrial Psychology. In addition, courses are available for graduate students majoring in Industrial Arts, Industrial Education, Agricultural Education, Textiles, Guidance, Industrial Engineering, Rural Sociology, and Statistics.

Upon completion of a Master's Degree in Industrial Psychology, a student may find employment in industry or business in personnel research, training programs, or safety. Very often he will be the Director of Personnel and Safety or may be employed as a Director in either of these two capacities. In larger business organizations and industries where a Ph.D. in Industrial Psychology is already employed, a student with a Master's Degree will be a member of the psychological group. Many opportunities exist for graduates in Industrial Psychology in state and government offices. The Armed Services are needing and will continue to need trained psychologists in their research programs.

The Department of Psychology operates a Psychological Clinic which provides individual testing and counseling services to students. Special problems in academic, personal, social and vocational areas are handled. This service is closely integrated with the college counseling program. Tests of intelligence, aptitudes, personality, interests, and educational achievement are administered for individual diagnosis. Through the remedial reading division of the clinic diagnostic and remedial help are provided students having reading difficulties.

In order to provide psychological services to industry, the Department recently established a bureau which is equipped to conduct personnel evaluations, employee counseling, personnel training, aptitude testing, attitude surveys, personnel research, and other psychological services.

A Division of Occupational Vision Research has been established in the Department to incorporate all research in vision. This Division is supported entirely by research grants from sources other than the college. The emphasis of the vision studies is directed towards occupational efficiency and safety.

An Applied Experimental Psychology Laboratory has been established in the Department for the purpose of making studies in human engineering. Emphasis is placed upon the design of experiments to study practical human problems. The design of machines to fit the human operator and the planning of work tasks in accordance with human capacities and limitations are major areas of concern.

THE SCHOOL OF ENGINEERING

John Harold Lampe, Dean of the School of Engineering

W. E. Adams, Director of Instruction

The School of Engineering offers technical and engineering instruction, both graduate and undergraduate, to meet the needs of the people and the industries of North Carolina. Engineering Research, which is an important function in its operation, supplements and supports graduate study through fundamental researches and experimental investigations.

The organization of the School of Engineering for purposes of administration operates Line and Functional Departments as follows:

Line Departments

Ceramic Engineering	Dr. W. W. Kriegel
Chemical Engineering	Dr. E. M. Schoenborn, Jr.
Civil Engineering	Dr. Ralph E. Fadum
Electrical Engineering	Dr. C. G. Brennecke
Geological Engineering	Dr. J. L. Stuckey
Industrial Engineering	Professor D. E. Henderson
Mechanical Engineering	Professor Karl P. Hanson
Physics	Dr. C. K. Beck

Functional Departments

Diesel and Internal Combustion Engines	Professor R. B. Rice
Engineering Mechanics	Dr. G. Wallace Smith
Engineering Research	Professor Norval W. Conner
Mathematics	Dr. H. A. Fisher

Line Departments offer programs of study to graduate as well as undergraduate students, whereas Functional Departments conduct a program of graduate study and offer service courses to all departments of the College. All department administrative officers are members of the Executive Committee of the School of Engineering.

All engineering instruction for the Consolidated University of North Carolina is given at North Carolina State College. The School of Engineering at Raleigh has an excellent staff and facilities. It is rapidly developing, both in physical plant and modern progressive educational programs.

The excellence of the instruction in the School of Engineering is attested by the fact that the Engineers' Council for Professional Development has accredited its curricula in Ceramic, Chemical, Civil, Electrical, Industrial, Mechanical Engineering and Aeronautical Option. It is the policy of the School of Engineering to have all of its curricula meet the standards of this nationally recognized accrediting agency.

Purpose

All of the undergraduate programs of study in the School of Engineering are so arranged that they contain broadening courses in the humanities while emphasizing the basic and fundamental engineering principles so essential to an engineering college program. Graduates of this new program will not only be prepared for engineering responsibilities and positions of trust in industry, but will have an appreciation and consciousness of human problems in community and industrial life.

Program

The activities of the School of Engineering are devoted to undergraduate instruction, professional (fifth year) study, graduate study (Master of Science and Doctor's degrees), and fundamental and applied research. Within the School of Engineering eight different departments offer programs of study. The curricula representing the study programs in all of these departments are so arranged that the freshman program is common to all. Though an entering student is asked to designate a field of interest, he can with ease and without any interruption change to some other field of study within the School of Engineering at the end of the freshman year.

Four-Year Bachelor's Curricula and Professional (Fifth Year) Study

The four-year program provides education and training to meet the needs of from eighty to eighty-five per cent of the young men of our State who will take their places in industry and industrial life in the fields of production, sales, application, planning, and the operation of small industrial units.

The fifth-year specialized training leads to a professional degree (C.E., Ch.E., M.E., E.E., etc.) in the departments of ceramic, chemical, civil, diesel, electrical, geological, industrial, and mechanical engineering. The courses of study are especially designed to meet the needs of students desiring intensive specialization in a particular field or additional course work not ordinarily covered in the normal four-year undergraduate curricula.

Graduate Study

The graduate activities are patterned to provide advanced training and experience to young men who have successfully completed a four-year program and who have an interest and ability to continue their education. This effective program will train our graduates for positions and activities in teaching, technical design, and research. The Engineering School offers two programs of graduate study. The first represents a year of full-time study and thesis work and leads to a degree of Master of Science in some field of engineering. The second program leads to a Doctor's degree in some field of engineering and usually requires three years of full-time study, thesis work, and experimental activity.

Research

Our research activities are based on a program correlated with graduate study in engineering. It is the purpose of this program not only to train future research workers, but also to carry out a program that assures both sound investigations of a fundamental nature in engineering sciences and of work devoted to greater uses of the State's natural resources. Through publication, cooperative activity with industry and the operation of our own investigational projects, it is intended that our engineering research activities will be a part of and work effectively with the industrial development of North Carolina.

Curricula

Undergraduates

Revised engineering curricula became effective September, 1947, offering a modern four-year program leading to a Bachelor's degree, patterned to serve the educational needs of the greater number of the young people of our State. Under this program, which offers broadening studies in the humanities as well as basic and fundamental instruction in engineering, the minimum credit-hour requirement for graduation will be from 225 to 228 credit hours.

The engineering curricula in the freshman year include a course in contemporary civilization of three credit hours each term, a total of nine credit hours. The freshman program also includes a three-credit hour course each term in English composition. No other course classified as humanities or social science will be offered in the first year's program. The twenty-four hours assigned to the three other areas of the humanities include: literature, history, economics, sociology, or political science, and contemporary problems. Thus, the forty-two credit hours devoted to the humanities will be divided with eighteen credit hours in the freshman year and twenty-four hours in the remaining three years, with not more than three hours in any one term. This humanistic program is definitely planned and integrated with an excellent four-year professional engineering course of instruction.

Professional (Fifth Year)

The fifth-year curricula are especially designed to meet the needs of students desiring intensive specialization in a particular field of additional course work not ordinarily covered in the normal four-year undergraduate curricula.

To meet the requirements of the professional degree, fifth-year students are subject to the same rules regarding faithfulness in performance of assigned tasks and regarding examinations and credit as undergraduate students. Work of a professional character presupposes a greater amount of time for study in the library or the laboratory; and the student, being more mature, is thrown more upon his own responsibility. The basic idea of the fifth-year program is a more intense specialization and a more active investigation than is necessary or wise in undergraduate instruction.

Degrees

Bachelor of Engineering.—The four-year curricula offer programs of study leading to a Bachelor's degree in Ceramic, Chemical, Civil, Electrical, Geological, Industrial, Mechanical, and Nuclear Engineering. Aeronautical Engineering is an option in Mechanical Engineering.

Bachelor of Science in a Specialized Branch of Engineering.—This is an earned undergraduate degree and is available through programs of study in Construction, Furniture Manufacture and Management, and Heating and Air Conditioning. The course is planned for four years of study. The graduation requirements are the satisfactory completion of all the required courses in one of the prescribed curricula, total of not less than 225 to 228 term credits, and not less than 225 to 228 honor points ("C" average). A minimum of six continuous weeks of gainful employment is a further specific requirement for graduation in engineering.

Professional Degree in a Specialized Branch of Engineering.—This is an earned degree which can be obtained only after the Bachelor's degree. The fifth-year curricula are especially designed to meet the needs of students desiring intensive specialization in a particular field or additional course work not ordinarily covered in the normal four-year undergraduate curricula. This professional program of study is offered in Ceramic, Chemical, Civil, Electrical, Geological, Industrial, Mechanical, and Diesel Engineering.

Further information concerning the requirements for the professional degree, applications for admission, etc., may be obtained by addressing Dr. J. H. Lampe, Dean of Engineering, State College, Raleigh, N. C.

Master of Science (M.S.) in a Specialized Branch of Engineering.—This is an earned graduate degree which can be obtained only after the Bachelor's degree. It requires at least one year of graduate work, a reading knowledge of at least one foreign language, and a thesis showing ability to pursue independent research. The core of graduate courses taken must emphasize a scientific objective. Further information concerning the requirements for this degree may be obtained by addressing Dr. D. B. Anderson, Director of Graduate Studies, State College, Raleigh, N. C.

Doctor of Philosophy Degree (Ph.D.).—This is an earned graduate degree offered in ceramic, chemical, electrical, and nuclear engineering, and engineering physics and admission is the same as for the master's degree. It requires at least two years of graduate work with a major in ceramic, chemical, or electrical engineering and a minor either in some other field of engineering or in an allied science. The dissertation will also deal with some problem in the field of the student's major interest. Inquiries about this program should be addressed to Dr. D. B. Anderson, Director of Graduate Studies, State College, Raleigh, N. C.

The Honorary Degree of Doctor of Engineering (D.Eng.).—This degree is purely an honorary degree conferred upon men of extraordinarily high professional engineering attainments who are graduates of one of the branches of the University of North Carolina, or upon professional engineers who have rendered distinguished services to the State of North Carolina.

Non-Scholastic Requirements

Summer Work: Industrial Employment.—A minimum of six continuous weeks of gainful employment is a specific requirement for graduation in Engineering. This employment may be as laborer, sub-professional, or professional assistant in any of the following fields: (1) industrial manufacture, repair service, or sales; (2) industrial, engineering or scientific research; (3) engineering or architectural design, and drafting; (4) engineering exploration, surveying, or reconnaissance; (5) construction of buildings, roads, railroads, dams, and other engineering works.

Students are required to consult with their department heads as to the type of work that will be acceptable before making arrangements for industrial employment. It is desirable that this employment be in the field of the student's scholastic major. The required industrial employment should be completed during a summer vacation period, which may be the one between the sophomore and junior years or the one between the junior and senior years, preferably the latter. Students enrolled for advanced military training should complete the industrial employment requirement between the sophomore and junior years to avoid conflict with ROTC Summer Camp.

The student is responsible for obtaining his employment and supplying satisfactory evidence thereof to the head of his department. This evidence will consist of a letter from the employer to the head of the student's department setting forth (1) inclusive dates of employment; (2) character of work performed; (3) type of operation of firm or individual; (4) an evaluation of the student's work. This letter must be submitted to the student's department head not later than the end of the Fall term of the year in which the student intends to graduate.

Inspection Trips.—In order to familiarize himself with the practice of his profession, each senior in Engineering is required, as a part of his curriculum, to take the departmental inspection trips. No student will be excused except for grave reasons.

These inspection trips are arranged by the head of the department in which the student takes his major work. The cost of such trips is approximately $50.00 per student, depending on the time and distance traveled.

Short Courses and Institutes

The School of Engineering cooperates with the College Extension Division in offering short courses and institutes both on the campus and at various centers throughout the State for adults and graduate engineers. Such courses vary in length from one day to twelve weeks; each year the courses offered are different and vary according to the public demand. The faculty of the School of Engineering usually furnish a large portion of the instruction offered in these courses, which in the past have been for Electrical Metermen, Gas Plant Operators, Safety Engineers, Radio Engineers, Refrigeration and Air Conditioning Engineers, Waterworks Operators, Heating and Plumbing Contractors, and Surveyors. Classes are usually held in Raleigh where the School of Engineering has an excellent staff and adequate laboratories and classroom facilities available.

These short courses offer real opportunity to our practicing engineering personnel to follow a refresher program in their field of interest, as well as to become acquainted with the latest and most modern engineering procedures and equipment.

CURRICULA OFFERED IN THE SCHOOL OF ENGINEERING

Each of the following curricula is not only well balanced, but offers a liberal course of study in a technical and professional field. Each conforms to what is regarded by engineering educators as the best modern practice.

Freshman Year of All Engineering Curricula

	Terms and Credits		
COURSES	F	W	S
Chem. 101, 102—General Inorganic Chemistry	4	4	0
Chem. 103—Qualitative Analysis	0	0	4
Eng. 101, 102, 103—Composition	3	3	3
Math. 101, 102, 103—Algebra, Trigonometry, Analytical Geometry	4	4	6
M.E. 101, 102, 103—Engineering Drawing	2	2	2
S.S. 101, 102, 103—Contemporary Civilization	3	3	3
*Military Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education and Hygiene	1	1	1
	19	19	21

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* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

Students are required to select their special field of Engineering study (such as Civil or Mechanical Engineering, etc.) when they apply for admission to the College.

The sophomore, junior, and senior programs of study in the various fields of Engineering are shown under the department headings on the pages that follow.

Humanities-Social Studies Program for Engineering Students

A carefully integrated four-year program required of students in the School of Engineering was inaugurated in September, 1947. All students take S.S. 101, 102, 103 (Contemporary Civilization) in their first year, and the Sophomore, Junior and Senior years as follows:

	CREDITS
Literature of Western World, Eng. 296, 297, and Western World Hist. 242; (or) Western World Hist. 241, 242, and Literature of Western World, Eng. 297; (or) The American Mind. Eng. 265, 266, and U. S. History 122 (or) U. S. History. Hist. 121, 122, and The American Mind. Eng. 266	3-3-3
Economics 344, 345, and either Pol. Sc. 351 or Sociology 343	3-3-3
Contemporary Problems. SS. 392, 393	0-3-3

CERAMIC ENGINEERING

Professor W. W. Kriegel, Head of the Department

Research Professor W. C. Bell*, Associate Professor Charles V. Rue
Instructor Willis E. Moody, Jr.

Ceramic Engineering includes those phases of Engineering which have to do with the development and application of manufacturing processes to the non-metallic materials in the production of a large variety of well known products. Principal among these products are glass in all its forms, vitreous enamel on steel products, building brick and tile, sewer pipe, wall and floor tile, refractories, high temperature insulating materials, tableware, pottery, electrical and chemical porcelains, chemical and sanitary stoneware, Portland and hydraulic cements and abrasives. The purpose of the course in Ceramic Engineering is to prepare men for careers in these industries.

The work of the Ceramic Engineer is so extensive and diversified that his training must be broad and basic in character. It involves the training in and the application of mathematics, physics, chemistry, geology, and fundamental engineering principles to the design of processes and products in the ceramic industries. Basic to these processes is the treatment of the product at elevated (usually incandescent) temperature. In such treatment the minerals undergo physical and chemical changes resulting in the production of glasses and recrystallized materials which determine the physical properties of the finished product. Ceramic Engineering courses consist of theoretical and practical consideration of mining and beneficiation of raw materials, processing and production of ceramic products, and testing of the materials and products, as well as the design of ceramic engineering equipment and plants. This program of study is fully accredited by the Engineers' Council for Professional Development.

Throughout the entire program of instruction the spirit of research and experimentation is fostered, culminating in an original laboratory investigation and an original program in plant design, both necessarily of limited scope.

Employment opportunities in Ceramic Engineering are numerous, varied, and continually increasing. Graduates of the Department of Ceramic Engineering are employed as plant executives, research engineers, plant-control engineers, technical sales and service engineers, plant designers and constructors, teachers and technologists. Students desiring to pursue careers in research and development or in teaching and consulting work are strongly advised to consider graduate training. The need for ceramic engineers having advanced training beyond the regular four year program is continually increasing.

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* Member Engineering Research Department.

CURRICULUM IN CERAMIC ENGINEERING

Sophomore Year

For the Freshman Year, refer to page 125

	Terms and Credits		
COURSES	F	W	S
Cer. E. 202—Ceramic Materials	0	2	0
Cer. E. 203—Ceramic Processes	0	0	3
Chem. 215, 216—Quantitative Analysis	3	3	0
Geol. 120—Physical Geology	4	0	0
Math. 201, 202, 303—Calculus I, II, III	4	4	4
Phys. 201, 202, 203—Gen. Physics	5	5	5
Literature or History	0	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	20	18

Junior Year

COURSES	F	W	S
Cer. E. 301—Ceramic Drying	3	0	0
Cer. E. 302—Ceramic Drying	0	3	0
Cer. E. 307, 308, 309—Ceramic Laboratory	2	2	2
Cer. E. 313—Instrumentation in Ceramics	0	0	2
Cer. E. 403—Silicates I	0	0	3
Chem. 331, 332—Physical Chemistry	3	3	0
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
Geol. 230—Mineralogy	0	0	4
M.E. 307—Engineering Thermodynamics	0	3	0
Stat. 361—Introduction to Industrial Statistics	3	0	0
Literature or History and Economics	3	3	3
**Electives	3	3	3
	20	20	20

Summer Requirement: Six weeks' industrial employment.

Senior Year

COURSES	F	W	S
Cer. E. 404, 405—Silicates II, III	3	3	0
Cer. E. 411, 412—Ceramic Lab. II	2	2	0
Cer. E. 413—Senior Thesis	0	0	3
Cer. E. 415, 416, 417—Ceramic Engr. Design	3	3	3
E.M. 321—Strength of Materials	3	0	0
E.E. 320, 321—Elements of E.E.	0	3	3
E.E. 325, 326—E.E. Lab.	0	1	1
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
S.S. 392, 393—Contemporary Problems	0	3	3
**Electives	3	3	3
	17	18	16

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* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

All seniors are required to make a plant inspection trip.

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

PROFESSIONAL STUDY IN CERAMIC ENGINEERING

A fifth, or professional, year of study is offered in Ceramic Engineering, as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree of Ceramic Engineer, and is specifically designed for those planning a career in industrial production activities.

FIFTH YEAR CURRICULUM IN CERAMIC ENGINEERING

COURSES	Terms and Credits F	W	S
Cer. E. 503—Ceramic Microscopy	0	0	3
Cer. E. 506—Advanced Studies in Drying	0	3	0
Cer. E. 511—Advanced Studies in Firing	0	0	3
Cer. E. 517, 518, 519—Advanced Cer. Experiments	3	3	3
Cer. E. 601—Ceramic Chemistry	3	0	0
Chem. 542—Colloid Chemistry	0	3	0
Geol. 531, 532—Optical Mineralogy	3	3	0
I.E. 408—Production Control	3	0	0
I.E. 443—Quality Control	0	0	3
*Advanced Ceramic Studies	3	3	3
	15	15	15

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* Select from two course sequences: Structural Clay Products, Cer. E. 632, 633; Refractories, Cer. E. 635, 636; Whitewares, Cer. E. 639, 640; Ceramic Colors and Enamels, Cer. E. 644, 645; Glass Technology, Cer. E. 647, 648.

GRADUATE STUDY IN CERAMIC ENGINEERING

Graduate work in Ceramic Engineering is offered leading to the degrees of M.S. in Cer. E. and Ph.D. For general regulations, the announcements of the Graduate School should be consulted.

CHEMICAL ENGINEERING

Professor E. M. Schoenborn, Head of the Department

Professors K. O. Beatty, F. P. Pike; Associate Professor R. Bright
Assistant Professors D. S. Arnold, J. F. Seely
Instructors C. A. Plank, E. B. Finch

Chemical Engineering is concerned with the development and application of manufacturing and allied processes in which chemical or certain physical changes of material are involved. It involves the application of mathematics, chemistry, physics and fundamental engineering principles to the design, construction, operation, control and improvement of equipment for carrying out chemical processes on an industrial scale at the lowest possible cost. Most of the so-called process industries—the production of chemicals, plastics, rubber, paints, synthetic fibers, petroleum, paper, explosives, drugs, food, soap, magnesium, aluminum, glass, cement and numerous others—are inherently chemical engineering in nature. To prepare men for careers in industries of these kinds is the purpose of the course in Chemical Engineering.

The work of the chemical engineer is so extensive and diversified in scope that his training must be along broad and basic lines rather than in any one field of specialization. Furthermore, the spirit of research and experimentation is vital to the chemical industry so that the development not only of a sound technical background but of a capacity for original thought and independent accomplishment is an essential part of his program. The undergraduate curriculum emphasizes the engineering, the chemical and the economic principles involved in chemical processes and operations. The work in chemistry including inorganic, analytical, physical and organic chemistry is comparable to that usually given to chemists in the first three years with the exception of a reduction of time devoted to laboratory work. The subjects in mechanical and electrical engineering, in mechanics and metallurgy, are designed to supply the fundamentals of these branches. The work in the Chemical Engineering subjects although distinctly professional in application is nevertheless basic in character. Since it depends upon a thorough background in the sciences, it is postponed until the third and fourth years. It is designed to develop initiative, sound habits of thought and intellectual curiosity in the student.

The Chemical Engineering Laboratories are provided with pilot plant-type equipment for studying the principles of fluid flow, heat transfer, distillation, absorption, drying, crushing and grinding, filtration, agitation, etc. Much new equipment has been installed and new and special apparatus is added from time to time to keep the facilities abreast of recent developments in the field. Special equipment for research and instructional purposes are designed and built in the department laboratories. In this way students are given firsthand acquaintance with problems relating to the actual design, construction and operation of typical types of equipment used in industry.

Opportunities for employment in the chemical and allied industries upon graduation are numerous and varied. Graduates find employment in such fields as: research and development; production, operation and maintenance; management and administration; inspection, testing and process control; technical service and sales; estimation and specification writing; consulting and teaching, and many others. Students desiring to pursue careers in research and development or in teaching and consulting work are strongly advised to consider graduate training. In fact the need for persons having had advanced training in the field beyond the regular four-year program is continually increasing.

Participating with the Department of Chemical Engineering each year, The American Institute of Chemical Engineers Student Chapter gives the senior student in Chemical Engineering who submits the best report on project work done in connection with the course, "Chemical Engineering Projects," an award jointly determined by the staff and the Student Chapter.

CURRICULUM IN CHEMICAL ENGINEERING

For the Freshman year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Ch.E. 205—Chemical Process Principles I	0	0	3
Chem. 215, 216, 217—Quantitative Analysis	3	3	3
Math. 201, 202, 303—Calculus I, II, III	4	4	4
Phys. 201, 202, 203—General Physics	5	5	5
Literature or History	3	3	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	18	18	18

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* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

Junior Year

COURSES	Terms and Courses F	W	S
Ch. E. 311, 312—Chemical Process Principles II, III	3	3	0
Ch. E. 313—Unit Operations I	0	0	3
Ch. E. 315—Chemical Engr. Thermodynamics	0	0	3
Chem. 425, 426—Organic Chemistry	4	4	0
Chem. 531, 532—Physical Chemistry	4	4	0
E.M. 311, 312, 313—Engr. Mechanics	3	3	3
M.E. 321—Metallurgy	0	0	3
Economics & Literature or History	3	3	3
**Electives	3	3	3
	20	20	18

Summer Requirement: Six Weeks' industrial employment.

Senior Year

	F	W	S
Ch. E. 411, 412—Unit Operations II, III	3	3	0
Ch. E. 415—Chemical Engr. Thermodynamics II	3	0	0
Ch. E. 431, 432, 433—Unit Operations Lab.	3	3	3
Ch. E. 472, 473—Chemical Engineering Projects	0	3	3
Ch. E. 527—Process Engineering	0	0	4
E.E. 320, 321—Elements of E. E.	0	3	3
E.E. 325, 326—E.E. Lab.	0	1	1
E.M. 321—Strength of Materials	3	0	0
P.S. 351 or Soc. 343—Political Sci. or Sociology	0	0	3
S.S. 392, 393—Contemporary Problems	3	3	0
**Electives	3	3	3
	18	19	20

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

PROFESSIONAL STUDY IN CHEMICAL ENGINEERING

A fifth, or professional, year of study is offered in Chemical Engineering, as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree of Chemical Engineer.

FIFTH YEAR CURRICULUM IN CHEMICAL ENGINEERING

COURSES	Terms and Credits F	W	S
Ch. E. 461, 462—Chem. Engr. Seminar	1	1	0
Ch. E. 546—Chemical Reaction Rates	0	3	0
Ch. E. 571, 572, 573—Chem. Engr. Projects	2	2	2
Ch. E. 611, 612—Advanced Unit Operations	3	3	0
Ch. E. 653—Adv. Topics in Chem. Engr.	0	0	2
Chem. 537—Instrumental Meth. Analysis	0	0	5
Chem. 542—Colloid Chemistry	0	3	0
I.E. 301—Engineering Economy	0	0	3
Phys. 407—Intro. to Modern Physics	3	0	0
Stat. 361—Intro. Statistics for Engrs.	3	0	0
Approved Electives	3	3	3
	15	15	15

GRADUATE STUDY IN CHEMICAL ENGINEERING

For general regulations, the announcement of the Graduate School should be consulted. Graduate work is offered in Chemical Engineering leading to the degrees of M.S. in Ch.E., and Ph.D.

CIVIL ENGINEERING

Professor Ralph E. Fadum, Head of the Department

Professor Emeritus C. L. Mann

Professors W. F. Babcock, C. R. Bramer; Associate Professors C. Smallwood, M. E. Uyanik; Assistant Professors W. W. Boyer, L. S. Hensley, C. M. Lambe, J. O. Litchford, C. R. McCullough, N. L. Nemerow; Instructors A. A. Alliss, D. H. Baxter, R. H. Bigelow, C. H. Kahn; Teaching Fellow N. C. Costes

The Department of Civil Engineering is located in the Civil Engineering Building in which the offices, classrooms, laboratories, and instrument rooms were designed and built to provide suitable facilities for efficient teaching and laboratory instruction.

Civil Engineering is the oldest and one of the broadest of all the branches of modern engineering. The breadth in scope of Civil Engineering is such that a student who does not have a strong predilection for some special branch of engineering may be safely advised to study Civil Engineering.

The Civil Engineering curriculum in the School of Engineering has been accredited by the Engineers' Council for Professional Development. It is a well-balanced course of study, upon the completion of which the graduate is equipped to assume the duties of junior engineer in any of the following important fields: design, construction, operation and maintenance of buildings, dams, bridges, water-front structures, water works, water power developments, sewage disposal works, and transportation facilities including highways, railways, waterways, airways and pipe lines.

The Civil Engineering Department offers a four-year curriculum leading to the degree, Bachelor of Civil Engineering. The department offers a separate and distinct four-year curriculum in construction leading to the degree, Bachelor of Science in Construction. It also offers a fifth-year curriculum leading to the professional degree, Civil Engineer, as well as a graduate program leading to the degree, Master of Science in Civil Engineering.

CURRICULUM IN CIVIL ENGINEERING

For the Freshman Year, refer to page 125

Sophomore Year

COURSES	Terms and Credits F	W	S
C.E. 203, 204, 205—Surveying I, II, III	3	3	3
Math. 201, 202, 303—Calculus I, II, III	4	4	4
M.E. 201—Descriptive Geometry	2	0	0
Phys. 201, 202, 203—General Physics	5	5	5
Literature and History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	18	18

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* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

Junior Year

COURSES	Terms and Credits F	 W	 S
C.E. 301, 303—Transportation Engineering I, II	3	0	3
C.E. 331, 332, 333—Materials Testing Lab.	2	2	2
C.E. 342—Soil Properties	0	3	0
Econ. 344, 345—Economic Principles	3	3	0
E.E. 320, 321—Elements of E.E.	0	3	3
E.E. 325, 326—Electrical Engr. Laboratory	0	1	1
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
E.M. 321, 422—Strength of Materials	0	3	3
Geol. 120—Physical Geology	4	0	0
**Electives	3	3	3
	18	21	18

Summer Requirement: Six weeks' industrial employment.

Senior Year

C.E. 421—Elements of Structural Design	3	0	0
C.E. 422—Reinforced Concrete	0	3	0
C.E. 423—Structural Design	0	0	6
C.E. 431—Analysis of Simple Structures	3	0	0
C.E. 432—Indeterminate Structures	0	3	0
C.E. 441—Soil Mechanics	3	0	0
C.E. 454—Hydraulics	0	3	0
C.E. 456—Hydrology and Drainage	0	3	0
C.E. 459—Water Works	0	0	3
C.E. 491—Professional Practice	1	0	0
E.M. 430—Fluid Mechanics	3	0	0
M.E. 307—Engineering Thermodynamics	0	0	3
P.S. 351 or Soc. 343 and S.S. 392, 393—Political Science or Sociology and Contemporary Problems	3	3	3
**Electives	3	3	3
	19	18	18

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. **Each student should plan the entire 18 elective credits in consultation with his adviser.**

PROFESSIONAL STUDY IN CIVIL ENGINEERING

A fifth, or professional, year of study is offered in Civil Engineering, as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree, Civil Engineer. To qualify for this degree the following curriculum in Sanitary Engineering, or Soil Mechanics and Foundations, or Structural Engineering, or Transportation Engineering may be followed.

FIFTH YEAR CURRICULUM IN SANITARY ENGINEERING

COURSES	Terms and Credits F	 W	 S
C.E. 453—Contracts and Specifications	0	0	3
C.E. 555—Theory of Water and Sewage Treatment	3	0	0
C.E. 556—Analysis of Water and Sewage	0	3	0
C.E. 557—Unit Operations & Processes in Sanitary Engineering	0	0	3
C.E. 559—Fundamentals of Sewage Works	3	0	0
C.E. 599—Civil Engineering Projects	0	3	3
C.E. 644—Ground Water and Seepage	0	0	3
C.E. 651—Advanced Water Supply	3	0	0
C.E. 652—Advanced Water Purification	0	3	0
C.E. 653—Advanced Sewerage	3	0	0
C.E. 654—Advanced Sewage Treatment	0	3	0
Approved Electives	3	3	3
	15	15	15

FIFTH YEAR CURRICULUM IN SOIL MECHANICS AND FOUNDATION ENGINEERING

	Terms and Credits		
COURSES	F	W	S
C.E. 501—Airphoto Interpretation	3	0	0
C.E. 529—Analysis and Design of Masonry Structures	0	0	3
C.E. 542, 543—Soil Testing for Engineering Purposes	0	3	3
C.E. 545—Foundation Engineering	0	0	3
C.E. 631, 632—Rigid Frame Analysis	3	3	0
C.E. 644—Ground Water and Seepage	0	0	3
C.E. 645, 646—Advanced Soil Mechanics	3	3	0
Geol. 462—Engineering Geology	0	3	0
Math. 401—Differential Equations	3	0	0
Approved Electives	3	3	3
	15	15	15

FIFTH YEAR CURRICULUM IN STRUCTURAL ENGINEERING

C.E. 525, 526, 527—Advanced Structural Design	3	3	3
C.E. 545—Foundation Engineering	0	0	3
C.E. 631, 632—Rigid Frame Analysis	3	3	0
C.E. 633—Bridge Analysis	0	0	3
C.E. 638—Structural Connections	0	3	0
C.E. 639—Structural Specifications	0	3	0
E.M. 551—Advanced Strength of Materials	3	0	0
E.M. 602—Elastic Stability	0	0	3
Math. 401—Differential Equations	3	0	0
Approved Electives	3	3	3
	15	15	15

FIFTH YEAR CURRICULUM IN TRANSPORTATION ENGINEERING

C.E. 501—Airphoto Interpretation	3	0	0
C.E. 504—Applied Photogrammetry	0	3	0
C.E. 511—Traffic Engineering	3	0	0
C.E. 529—Analysis and Design of Masonry Structures	0	0	3
C.E. 607—Pavement Design	0	0	3
C.E. 613—Highway Engineering Economics	0	0	3
C.E. 614—Advanced Traffic Engineering	0	3	0
C.E. 616, 617—Geometric Highway Design	0	3	3
Econ. 541, 542—Economics of Transportation	3	3	0
Stat. 361—Introduction to Statistics for Engrs.	3	0	0
Approved Electives	3	3	3
	15	15	15

CONSTRUCTION

The Civil Engineering Department in addition to its regular program offers an independent four-year college curriculum leading to the degree of Bachelor of Science in Construction. The freshman year of this curriculum prescribes the same college work that is recommended for all students in the School of Engineering. The program became effective September, 1949, for those students starting their freshman and sophomore years. This program has the support of the contractors and road builders organizations in North Carolina. It is hoped that the training will qualify the graduates of this program for effective employment in general construction work in North Carolina.

The majority of men entering the construction industry require some engineering training. In addition, they face problems of labor, management, organization, and finance. The curriculum provides a reasonable balance of training in these fields and should give the student a firm foundation from which he can expand and grow through self-effort on the job in later years.

The curriculum in Construction is designed to prepare the student to enter the construction industry and to provide him with adequate preparation for future work as an owner, manager, or executive in this industry.

CONSTRUCTION CURRICULUM

For the Freshman Year, refer to page 125

Sophomore Year

COURSES	Terms and Credits		
	F	W	S
Arch. 205, 206—Working Drawings	0	2	2
C.E. 203, 204—Surveying	3	3	0
E.M. 213—Elements of Mechanics	0	0	3
Eng. 211—Business Correspondence	0	0	3
I.E. 206, 207—Industrial Organization & Management	3	3	0
Math. 201—Calculus I	4	0	0
Phys. 211, 212, 213—General Physics	4	4	4
Literature or History	3	3	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	18	18

Junior Year

C.E. 229—Analysis of Framed Structures	0	0	3
C.E. 331, 332—Materials Testing Laboratory	2	2	0
C.E. 357—Construction Estimates	3	0	0
C.E. 358—Construction Estimates and Costs	0	3	0
C.E. 359—Bids and Cost Control	0	0	3
Econ. 401, 402—Principles of Accounting	3	3	0
Econ. 409—Construction Accounting	0	0	3
Econ. 344, 345—Economics Principles	3	3	0
E.E. 340, 341, 342—Industrial Electricity	3	3	3
E.M. 325—Elementary Strength of Materials	3	0	0
E.M. 335—Fluid Flow	0	3	0
Geol. 120—Physical Geology	0	0	4
**Electives	3	3	3
	20	20	19

Senior Year

C.E. 325—Design of Structural Elements	3	0	0
C.E. 328, 329—Construction Design Problems	0	3	3
C.E. 343—Foundations	3	0	0
C.E. 367—Construction Plant Layout and Equipment	3	0	0
C.E. 368—Construction Planning & Organization	0	3	0
C.E. 369—Construction Project Analysis	0	0	3
C.E. 453—Contracts and Specifications	0	0	3
Econ. 431, 432—Labor Problems & Industrial Relations	3	3	0
Eng. 231—Public Speaking	0	0	3
I.E. 301—Engineering Economy	0	3	0
P.S. 351 or Soc. 343 and S.S. 392, 393—Political Science or Sociology and Contemporary Problems	3	3	3
**Electives	3	3	3
	18	18	18

Summer employment required for graduation.

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

DIESEL AND INTERNAL COMBUSTION ENGINES

Professor Robert B. Rice, Head of the Department

Visiting Professor A. Hoermann
Assistant Professor D. J. Hanse
Assistant Professor R. B. Cochran, Jr.
Special Lecturer R. A. Lineberry, M. M. Dana*

The Graduate Department of Diesel and Internal Combustion Engines, established by the Trustees of the University of North Carolina, was created to carry on research activities and graduate studies in the Diesel field and associated branches of technology.

The educational plan of the department is designed around the industry's need for scientists, designers, and research workers, not only in the manufacture of Diesels but in the numerous fields of transportation and power generation where they are universally employed. The prime function of the department is to offer education at the graduate level for both graduate degrees and for the retraining of engineers now in industry. The educational program is integrated closely with research projects involving both pure science and applied science.

The department now offers programs of study leading to the degree of Master of Science in Diesel Engineering built around exacting requirements in the fields of Diesel design, Diesel power plant design, experimental Diesel engineering, and Diesel operation and maintenance.

The research requirements for graduate degrees will be met in the department's new and modern laboratories, which are equipped to investigate all phases of the Diesel, away from the confining and demanding requirements of manufacturing and production in an environment dominated by scientifically trained minds, where the study and development of Diesels is sine qua non. Here studies and investigations will be conducted by imaginative and creative thinking young men.

The program of study is designed to be liberal to a point where a candidate may in addition to his Diesel studies select graduate courses in the fields of chemistry, economics, electrical engineering, engineering mechanics, mathematics, modern languages, mechanical engineering, physics, or statistics. Any student with a satisfactory scholastic record and a Bachelor's Degree, or the equivalent, from an accredited and recognized college or university will be admitted. A Diesel graduate student will be subject to all regulations and conditions of the Graduate School of the University of North Carolina.

It is the plan of the department to cooperate closely with the Diesel manufacturers as well as those fields wherein the Diesel is the most economical and universal prime-mover, especially the field of Transportation. Toward this end the department maintains close contact with the Diesel Industry and the Professional Societies dedicated to promote the Science of Oil and Gas Power.

The department encourages summer employment in the Diesel industry for its graduate students in an effort to vitalize the student's program of study and to better integrate it with the actual scientific problems of this industry.

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* On leave of absence.

A student enrolled as an upperclassman in an accredited college or university and planning to continue his studies at the graduate level in the Diesel field will find it advantageous to consult with this department concerning the selection of his curriculum and senior electives.

For general regulations, the announcement of the Graduate School should be consulted.

Professional Study in Diesel and Internal Combustion Engines

A fifth, or professional, year of study is offered in Diesel and Internal Combustion Engines. This fifth year offers specialized and advanced course work leading to the degree, Diesel Engineer. To qualify for this degree the following curriculum in Engine Design or Power Plant Design may be followed:

Fifth Year Curriculum in Engine Design

	Terms and Credits		
COURSES	F	W	S
Dies. 507, 508, 509—Internal Combustion Engine Fundamentals	3	3	3
Dies. 511, 512, 513—Internal Combustion Engine Fuels	2	2	2
Dies. 531—Survey of Internal Combustion Engines	3	0	0
Dies. 532, 533—Engine Design	0	3	3
Dies. 581, 582, 583—Internal Combustion Engine Experimentation	2	2	2
Dies. 585, 586, 587—Internal Combustion Engine Laboratory	2	2	2
Dies. 691, 692, 693—Seminar	1	1	1
Approved Electives	2	2	2
	15	15	15

Fifth Year Curriculum in Power Plant Design

Dies. 507, 508, 509—Internal Combustion Engine Fundamentals	3	3	3
Dies. 511, 512, 513—Internal Combustion Engines Fuels	2	2	2
Dies. 531—Survey of Internal Combustion Engines	3	0	0
Dies. 562, 563—Diesel Engine Applications	0	3	3
Dies. 581, 582, 583—Internal Combustion Engine Experimentation	2	2	2
Dies. 585, 586, 587—Internal Combustion Engine Laboratory	2	2	2
Dies. 691, 692, 693—Seminar	1	1	1
Approved Electives	2	2	2
	15	15	15

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor C. G. Brennecke, Head of the Department

Professor Emeritus William Hand Browne, Jr.

Professors V. S. Carson, R. S. Fouraker, W. F. Gauster, G. B. Hoadley, W. D. Stevenson, Jr.; Visiting Professor J. L. Beaver; Associate Professors A. R. Eckels, K. B. Glenn, E. W. Winkler; Assistant Professors E. G. Manning, R. J. Pearsall, F. R. Willard; Instructor R. L. Ramey.

Purpose.—The purpose of the undergraduate curriculum is to train young men for active work in a wide and diversified field. The electrical industry demands, above all else, a thorough preparation in the sciences underlying all branches of engineering, a broad foundation in fundamental electrical theory, and a clear understanding of the characteristics of electrical machinery and systems. These factors are essential for success, whether it be in the design and manufacture of electrical equipment, in power production and utilization, or the fields of communication and electronics, since in all these branches of the industry technical advances are being made with increasing rapidity. With this object in view, the curriculum in Electrical Engineering includes comprehensive training in mathematics and physics—the fundamental sciences—and adequate training in allied branches of engineering. All courses are accompanied by coordinated work in the laboratory and intensive drill in the application of theory by means of carefully planned problems. In the senior year, the student is offered a choice between two three-course sequences, one in Power and the other in Communications.

The curriculum includes a thorough drill in the preparation and delivery of technical reports.

Each student is required to spend at least six weeks in satisfactory industrial employment before receiving his degree and to take the Senior Spring Inspection trip during his last year in residence.

Departmental Student Activities.—Close coordination with the work of the American Institute of Electrical Engineers is effected through a student branch at the College, which meets twice a month; through the State Section of the Institute, which meets several times during the year; and through the regional meetings of the Institute, one section of which is organized as a student-activities conference. Student attendance at these meetings is strongly encouraged.

In a similar manner, the North Carolina State Student Branch of the Institute of Radio Engineers maintains a close connection with the North Carolina-Virginia Section of the Institute of Radio Engineers, and student members are encouraged to attend the monthly meetings of the Section at various cities in the two states. An annual Spring picnic, sponsored jointly by the student branches of the AIEE and the IRE, has become a tradition.

An active chapter of Eta Kappa Nu, the national honorary Electrical Engineering fraternity, undertakes numerous important projects in addition to holding two initiation banquets yearly.

The N. C. State College Radio Club, which maintains and operates an amateur radio transmitter station, is advised by the Department.

Buildings and Equipment.—The Department is housed in Daniels and Winston Halls. It maintains the following laboratories: Dynamo, Communications and Electronics, Industrial Electronics and Control, Measurements, Standards, and Photometry. In addition, there are an instrument room, a shop, and a number of research rooms.

CURRICULUM IN ELECTRICAL ENGINEERING

For the Freshman Year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
E.E. 201, 202, 203—Electrical Engineering Fundamentals	3	3	3
E.E. 215, 217—Electrical Measurements	1	0	1
Math. 201, 202, 303—Calculus I, II, III	4	4	4
Physics 201, 202, 203—General Physics	5	5	5
Literature and History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	18	19

Junior Year

	F	W	S
Econ. 344, 345—Consumer Economics	0	3	3
E.E. 301, 302, 303—Alternating Current Circuits and Lines	3	3	3
E.E. 305—Direct Current Machinery	3	0	0
E.E. 311, 312—Dynamo Laboratory	1	1	0
E.E. 415a, 416a—Fundamentals of Electronics	0	3	3
E.E. 415b, 416b—Electronics Laboratory	0	1	1
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
Math. 401—Differential Equations	3	0	0
M.E. 307, 308, 309—Engineering Thermodynamics	3	3	3
M.E. 313—Mechanical Engineering Lab. I	0	0	1
**Electives	3	3	3
	19	20	20

Summer Requirement: Six weeks, industrial employment.

Senior Year

	F	W	S
E.E. 401, 402—Alternating Current Machinery	3	3	0
E.E. 411, 412, 413—Advanced Dynamo Lab.	1	1	1
E.E. 445, 446, 447—Electrical Engineering Pro-Seminar	1	1	1
E.E. 501—Electrical Transients	3	0	0
E.E. 503—Electromagnetic Fields	0	0	3
E.M. 321—Strength of Materials	3	0	0
E.M. 430—Fluid Mechanics	0	0	3
Eng. 321—Technical Writing	0	3	0
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
S.S. 392, 393—Contemporary Problems	0	3	3
***Departmental Electives	3	3	3
**Electives	3	3	3
	20	17	17

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* Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The Junior and Senior Electives may be taken in advanced Military Science. If not, they are to be made up on the basis of 12 credits of technical course work and 6 credits in nontechnical fields. Each student should plan the entire 18 elective credits in consultation with his adviser.

*** For these 9 hours, students may choose either the sequence EE 581, 582, 583 (Electric Communication) or the three courses EE 527 (Electrical Transmission), EE 528 (Power Network Calculations), and EE. 424 (Central Stations).

Professional Study in Electrical Engineering

A fifth, or professional, year of study is offered in Electrical Engineering as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree of Electrical Engineer.

Fifth Year Curriculum in Electric Power

	Terms and Credits		
COURSES	F	W	S
C.E. 484—Hydraulics	0	3	0
E.E. 607—E.E. Seminar	0	0	1
E.E. 635—High Voltage Engineering	0	0	3
E.E. 634—Transmission Line Transients	0	4	0
E.E. 637, 638, 639—Power Systems	3	3	3
E.M. 422—Strength of Materials	3	0	0
E.M. 554—Vibration Problems	0	0	3
M.E. 401, 402, 403—Power Plants	3	3	3
M.E. 408—M.E. Lab.	0	1	0
Approved Electives	6	0	3
	15	14	16

Fifth Year Curriculum in Communications

	F	W	S
E.E. 606—E.E. Seminar	0	1	0
E.E. 611, 612—Communication Networks	3	3	0
E.E. 615—Electromagnetic Waves	3	0	0
E.E. 616, 617—Advanced Radio Engineering	0	4	4
Math. 511, 512—Advanced Calculus	3	3	0
Math. 541—Vector Analysis	0	0	3
Physics 407—Intro. to Modern Physics	0	0	3
Physics 541—Vibration and Wave Motion	3	0	0
Physics 542—Applied Acoustics	0	3	0
Approved Electives	3	0	6
	15	14	16

GRADUATE STUDY IN ELECTRICAL ENGINEERING

For general regulations, the announcement of the Graduate School should be consulted. Graduate work is offered in Electrical Engineering leading to the degree of M.S. in E.E., and to the Ph.D.

ENGINEERING MECHANICS

Professor G. Wallace Smith, Head of the Department

Professor Adolphus Mitchell
Assistant Professors L. W. Long, G. W. Middleton
Instructors J. E. Hardee, Maurice H. Clayton

Undergraduate Study

The Department of Engineering Mechanics teaches and administers the courses in theoretical and applied mechanics, strength of materials, and fluid mechanics. These courses are fundamental to the professional and design courses of the several Engineering curricula. The student is expected to acquire a basic knowledge of the physical properties of materials and the laws that govern their use in engineering design.

Graduate Study

A student interested in investigation and research, and who has the proper prerequisites, may take a course of study offered by this department which leads to the degree of Master of Science in Engineering Mechanics. For general regulations, the announcement of the Graduate School should be consulted.

THE DEPARTMENT OF ENGINEERING RESEARCH

N. W. Conner, Director

Research Professor of Ceramic Engineering: W. C. Bell; Research Associate Professor of Metallurgy: B. Floyd Brown; Research Associates: King R. Brose, John K. Ferrell, Frances M. Richardson, Hans H. Stadelmaier; Research Assistants: Daniel D. Cote, Richard D. Dillender, I. W. Gower, J. R. Hart, R. E. Hiller, B. L. Joyner, Harold Lominac, Joseph G. Lundholm, Jr., Arthur E. Lucier, A. B. MacIntyre, Harold Mott, Joseph R. Nelli, W. T. Withers; Research Engineer: Eugene E. Erickson; Chief Technician: Wade E. Griffin; Technicians: Allen D. Ferguson, R. F. Penny.

Research and teaching are the two responsibilities of the true university. The School of Engineering has clear appreciation of the obligation of education to further man's understanding of the world in which he lives and of the contribution of research to effective teaching. Within the School research programs are conducted in many fields of engineering. These activities are given strong encouragement and support through the Department of Engineering Research.

The Department, originally established in 1923 as the Engineering Experiment Station, maintains laboratories and a full-time staff devoted exclusively to experimental work. Its operations are carried out in close association with the administration and faculties of the teaching departments. The abilities of the various departments of engineering are combined through the Department so that the complete research capacity of the School of Engineering is available for experimental work in any field. The Department also acts as the administrator for the School in negotiations involving research programs done for private industry and Government agencies.

To assure wider benefits for both graduate and undergraduate students from the engineering research activities, the Department offers several Research Fellowships and employs on a part-time basis various numbers of the more promising and deserving students as assistants in the laboratory.

As a unit of North Carolina's Land-Grant College, State College's School of Engineering is obligated to serve the industrial life of the State. Functioning in this capacity, it offers a broad program of service and experimental aid through the Engineering Research Department. Many State industries have brought problems to the School, and association with the industrialists of the State is constantly being sought and strengthened. This service is further strengthened through close cooperation with the North Carolina Department of Conservation and Development. Particular encouragement and assistance are granted those investigations that give promise of new industry to North Carolina.

Today the research capacity of the nation is being called upon as a resource for national security. Research facilities of colleges and universities are prominent in this defense capacity, and North Carolina's School of Engineering is now strong in its abilities to serve among the leading engineering schools of the country. Several research programs sponsored by the services have been in progress here for several years, and the School's capacity for expanded service is large.

Research currently in progress includes work being done for the Air Materiel Command of the U. S. Air Force, the Office of Naval Research, Office of Ordnance Research, Bureau of Ships, Wright Air Development Center, Redstone Arsenal, and The Texas Company. Work is included in the fields of structural clay products, radiant heating, stress analysis, rotational speed deviation measurements, tannin extraction, recovery from fish oil waste, erosion of plastics, fuel oils, precipitation hardening and diffusion in alloys, and electronics.

The results of the engineering investigations, upon their conclusions, are published as bulletins so that the information obtained may be made available to the public and be contributed to the total field of technical knowledge. A complete list of the bulletins published to date or any other information pertaining to the operation or availability of the facilities of the Department will be furnished upon request.

THE PHYSICS DEPARTMENT

Professor Clifford K. Beck, Head of the Department

Professors F. W. Lancaster, J. S. Meares, A. C. Menius, Jr., R. L. Murray, R. H. Snyder, Newton Underwood; Visiting Lecturer Josef O. Nystrom; Associate Professors R. F. Stainback, Arthur Waltner; Assistant Professors E. J. Brown, Pelle G. Isberg, Elma Lanterman, J. T. Lynn; Research Assistant J. G. Lundholm, Jr.; Instructors A. W. Blackstock, Clyde B. Fulmer, Minnie C. Harris, V. E. Pilcher, L. H. Robinson, Mae Silbergeld.

Physics is one of the basic sciences upon which Agriculture, Engineering, and other branches of technology are based. The department, therefore, offers several general physics courses adapted to the needs of other departments and a number of advanced courses in specialized fields of physics avaliable as electives to graduates and undergraduates of all departments.

ENGINEERING PHYSICS

The Engineering Physics Curriculum is designed to provide, for bachelor graduates of various Engineering curricula, a year of specialized training in the subject matter and methods of physics. Upon satisfactory completion of the prescribed course of study, a degree of Master of Science in Engineering Physics is awarded. For students with inadequate undergraduate training in physics and mathematics, up to two year's time may be required for satisfactory completion of the course of study.

The curriculum, which includes both theoretical and applied physics courses, is intended to prepare students to fill the need of industrial and governmental laboratories for research and development workers in the borderline fields between engineering and pure physics.

MASTER OF SCIENCE IN ENGINEERING PHYSICS

Prerequisites

a. Differential Equations
b. Sophomore Physics
c. Three Additional Quarter Courses
d. Fluid Mechanics
e. Thermodynamics
f. Three Additional Quarter Courses in Engineering
g. Physics 407, 410

Requisites

COURSES	Credits
Phys. 601, 602, 603—Advanced General Physics	9
Phys. 690—Thesis	6
Phys. 670—Seminar	3
Mathematics	9
Phys. 611—Quantum Mechanics	3
*Electives	15
	45

* At least 12 of these elective credits must be selected, with the assistance of an advisory committee, as a coherent sequence in engineering or in mathematics and engineering.

NUCLEAR ENGINEERING

The Nuclear Engineering Curriculum is offered in response to the rapidly growing demand of industry and research organizations for engineers equipped with the basic knowledge and technology of radioactivity and nuclear processes. The field of nuclear engineering practice is so broad that practically all branches of science and engineering are involved, and hence one could not hope in four or even five years to become proficient in all phases. The general curriculum is planned, therefore, to include a basic core of required courses and a number of technical elective courses which are to be scheduled, with the assistance of an adviser, in one or two of several general fields of interest. In the sophomore or junior year the student in Nuclear Engineering selects, according to his interest, the engineering field in which he wishes broader training: Chemical, Electrical Mechanical, etc. The technical elective courses relating to this field of interest are then scheduled.

A Bachelor of Nuclear Engineering degree is awarded upon satisfactory completion of the prescribed four-year curriculum. For those desiring further training, graduate programs terminating in a Master's or Doctor's degree in Nuclear Engineering are offered.

UNDERGRADUATE CURRICULUM IN NUCLEAR ENGINEERING

Freshman Year, Standard Course

For the Freshman Year, refer to page 125

Sophomore Year

COURSES	Terms and Credits F	W	S
History and Literature	3	3	3
†P.E. 201, 202, 203—Physical Education	1	1	1
†Military Science II or Air Science II	2	2	2
Math. 201, 202, 303—Calculus I, II, III	4	4	4
Phys. 201, 202, 203—General Physics	5	5	5
**Technical Electives	4	4	4
	19	19	19

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† Students excused from Military or Air Science and/or Physical Education will schedule equivalent credits in courses outside their departments.

** See footnotes on page 143.

Junior Year

COURSES	Terms and Credits F	W	S
Political or Social Science, and Economics	3	3	3
***Electives	3	3	3
Math. 401, Differential Equations	3	0	0
Phys. 301, 302, 303 or 401, 402, 403—Intermediate Physics	4	4	4
*Phys. 407—Introduction to Modern Physics	0	3	0
*Phys. 410, Nuclear Physics I	0	0	4
**Technical Electives	6	6	4
	19	19	18

Senior Year

COURSES	F	W	S
S.S. 392, 393—Contemporary Problems	0	3	3
***Electives	3	3	3
*Phys. 411—Nuclear Instrumentation	3	0	0
*Phys. 520—Phys. Technology in Radioactivity	4	0	0
*Phys. 418—Radiation Hazard and Protection	0	3	0
*Phys. 419—Introduction to Nuclear Engineering	0	0	3
*Phys. 530—Elementary Reactor Theory	0	0	3
Math. 511—Adv. Calculus or Math. 532—Adv. Diff. Eq.	0	3	0
**Technical Electives	9	6	6
	19	18	18

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* The exact sequence of these courses, because of limited laboratory facilities, must be scheduled for each student according to departmental instructions.

** These 52 credit hours of technical electives must include
E.M. 311, 312, 321, 430
M.E. 307, 308 or Ch. E. 315, 415
E.E. 320, 321

Of the remaining 28 credit hours, at least 18 should be selected with the assistance of an adviser, as a well defined sequence in some chosen field of interest. The course sequence should normally be in some field of engineering, though occasionally students may choose to develop an interest in the pure sciences. See last footnote below.

*** These 18 credit hours of electives may be used for Advanced Military Science or for 6 credit hours of non-technical and 12 credit hours of technical courses.

MASTER OF SCIENCE IN NUCLEAR ENGINEERING

Prerequisites

a. Differential Equations
b. Sophomore Physics
c. Three Additional Quarter Courses in Physics
d. Fluid Mechanics
e. Thermodynamics
f. Three Additional Courses in Engineering
g. Physics 410
h. Physics 411
i. Physics 418
j. Physics 419

Requisites

COURSES	Credits
Physics 670, Seminar	3
Physics 690, Thesis	6
Mathematics	6
Any Two of the Following Courses	6
Phys. 610, Advanced Nuclear Physics	
Phys. 618, Advanced Radiation Hazard and Protection	
Phys. 619, Reactor Design	
Phys. 630, Advanced Reactor Theory	
*Technical Electives	24
	45

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*Must include a sequence of at least 12 credits in a minor field. It is recommended that course sequence be planned in one, or not more than two, of the following general areas:

1. Mechanical-Metallurgical
2. Heat transfer-power generation
3. Chemistry and Chemical Engineering
4. Instrumentation and Control
5. Theoretical (engineering, physics, and mathematics)
6. Biochemistry, biophysics, life sciences

DOCTOR OF PHILOSOPHY

In the spring of 1950 the Graduate School of the University of North Carolina granted authority to the Physics Department of North Carolina State College to enroll students for training to the doctorate level. In addition to the resources and facilities of the Physics Department, those of other departments at State College and of the Physics and Mathematics Departments of the University at Chapel Hill are available to these advanced students as their particular programs may require. Facilities are most extensive for work in the general fields of applied nuclear physics and solid state physics.

The usual rules and regulations of the graduate school, as described on page 179, apply to the Physics students enrolled in the doctorate program.

GEOLOGICAL ENGINEERING

Professor Jasper L. Stuckey, Head of the Department

Associate Professor, John M. Parker, III
Associate Professor, E. L. Miller, Jr.
Instructor Warren G. Steel

Function.—The function of the Department of Geology is twofold: first, to offer service courses required as prerequisites in the Agricultural, Educational, and Engineering curricula; second, to administer the curriculum in Geological Engineering.

The Curriculum is designed to train young men in the fundamentals of engineering and the special applications of geology. Many major engineering undertakings, such as construction of large dams and reservoirs, tunnels, and large buildings, depend for success on the exact knowledge of their geological setting. On the other hand, such geological problems as the economical development of mineral resources require the use of the precise methods of engineering. The curriculum combines these two types of information and training so necessary to success in this important specialized field.

Professional Outlook.—A graduate of this curriculum may follow one of two broad fields of engineering either in the United States or in foreign countries; one, the application of geology to engineering work, and the other the application of geology in the mineral industries. Geological engineers are in demand by oil and mining companies, engineering construction companies, municipalities, various public utilities, state and federal governmental agencies, and by schools, colleges, museums, and research institutes.

The southeast offers excellent possibilities to geological engineers. There is a growing need for the application of geological science to engineering construction in connection with foundations, excavations, and in water supply problems. In the region are deposits, only partially developed, of iron, coal, phosphates, mica, feldspar, spodumene, copper, nickel, kaolin, cyanite, sillimanite, barite, granite, limestone, talc, pyrophyllite, marls, and other minerals.

A fifth year of more specialized study, based on the fundamentals of the undergraduate curriculum, is available for those who desire advanced training in this field.

CURRICULUM IN GEOLOGICAL ENGINEERING

For the Freshman Year, refer to page 129

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Chem. 216—Quantitative Analysis	3	0	0
Geol. 120—Physical Geology	4	0	0
Geol. 222—Historical Geology	0	4	0
Geol. 230—Mineralogy	0	0	4
Math. 201, 202, 203—Calculus I, II, III	4	4	4
Phys. 201, 202, 203—General Physics	5	5	5
Literature and History	0	3	3
*Military Science II or Air Science II	2	2	2
P.E. 201, 202, 203—Physical Education	1	1	1
	19	19	19

Junior Year

M.E. 201—Descriptive Geometry	0	2	0
C.E. 208, 209—Surveying and Mapping	4	4	0
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
E.M. 321—Strength of Materials	0	0	3
Geol. 323—Paleontology	4	0	0
Geol. 332—Advanced Mineralogy	2	0	0
Geol. 351—Structural Geol.	0	0	4
Geol. 370—Mining Methods	0	0	4
Geol. 443—Petrology	0	4	0
Economics and Literature or History	3	3	3
**Electives	3	3	3
	19	19	20

Summer Requirement: Six weeks' industrial employment.

Senior Year

E.M. 430—Fluid Mechanics	3	0	0
Eng. 321—Technical Writing I	3	0	0
E.E. 320, 321—Elements of E.E.	0	3	3
E.E. 325, 326—Elements of E.E. Lab.	0	1	1
Geol. 412, 413—Economic Geology	0	3	3
Geol. 462—Engineering Geology	0	3	0
Geol. 463—Geological Surveying	0	0	4
Geol. 551—Sedimentation	3	0	0
Geol. 552 Stratigraphy	0	3	0
M.E. 307—Engineering Thermo.	3	0	0
S.S. 392, 393—Contemporary Problems	0	3	3
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
**Electives	3	3	3
	18	19	17

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* Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

Professional Study in Geological Engineering

A fifth, or professional, year of study is offered in Geological Engineering, as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree of Geological Engineer.

	Terms and Credits		
COURSES	F	W	S
Geol. 510—Mineral Industry	0	0	3
Geol. 515—Petroleum Geology	0	0	3
Geol. 531, 532—Optical Mineralogy	3	3	0
Geol. 553, 554—Geophysics	0	3	3
Geol. 571, 572, 573—Mining and Mineral Dressing	3	3	3
Geol. 611, 612—Advanced Economic Geology	3	3	0
Geol. 681, 682, 683—Seminar	1	1	1
Approved Electives	3	3	3
	13	16	16

Graduate Study in Geological Engineering

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Geological Engineering leading to the degree of M.S. in G.E.

DEPARTMENT OF INDUSTRIAL ENGINEERING

Professor D. E. Henderson, Head of the Department

Professor F. B. Wheeler; Associate Professors R. D. Furlong, E. S. Johnson; Assistant Professors R. L. Cope, R. W. Llewellyn; Instructors C. W. Maddison, R. Reed; Visiting Professor Rudolph Willard.

Industrial Engineering is a relatively new branch of the engineering profession. Its growth has been steady over the past ten years. As a college curriculum, it is the result of a demand by industry for graduates who are trained in the fundamentals of engineering and who have acquired a knowledge of how industry is organized and operated.

It is the industrial engineer's job to transform plans, specifications and blueprints into plant, equipment and personnel to produce the product. He is concerned also with controls and plans for the profitable and continued operation of an existing plant.

The Industrial Engineering program at North Carolina State College has been planned with this viewpoint in mind. After the first year, which is common with all other branches of engineering, the curriculum includes courses in Industrial Organization and Management, Time and Motion Study, Plant Layout, Quality Control, Job Evaluation, Accounting, Personnel and Labor Relations and Production Control together with other specialized courses which help develop a background and technique for understanding our modern industrial system.

The Industrial Engineering curriculum has been inspected and accredited by the Engineers' Council for Professional Development.

Student organizations within the department include a student chapter of the American Institute of Industrial Engineers.

North Carolina has many types of manufacturing in which industrial engineers may be employed. Whether the graduate goes into manufacturing, marketing and sales, or business, he is prepared through his training to understand the relationship between organization functions. This understanding is conducive to a higher efficiency of individual performance and more rapid preparation for managerial positions.

CURRICULUM IN INDUSTRIAL ENGINEERING

For the Freshman Year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
I.E. 114, 115, 116—Pattern Making Lab., Foundry Lab., Welding Lab.	1	1	1
I.E. 206, 207—Industrial Organization & Management	3	3	0
I.E. 227, 228, 229—Machine Tool Laboratory	1	1	1
I.E. 328 Manufacturing Processes	0	0	3
Math. 201, 202, 203—Calculus I, II, III	4	4	5
Physics 201, 202, 203—General Physics	5	5	5
Literature & History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	20	20

Junior Year

	F	W	S
Econ. 344, 345—Economic Principles	0	3	3
Econ. 401, 402, 410—Princ. of Accounting and Manufacturing Acct.	3	3	3
E.M. 311, 312—Engr. Mech.	3	3	0
E.M. 321—Strength of Materials	0	0	3
I.E. 301—Engineering Economy	0	0	3
I.E. 332—Motion & Time Study	4	0	0
I.E. 343—Plant Layout & Design	0	4	0
I.E. 408 Production Control	0	0	4
M.E. 307, 308—Engineering Thermodynamics	3	3	0
M.E. 313—Mech. Engr. Lab.	1	0	0
Psych. 200—Introduction to Psychology	3	0	0
**Electives	3	3	3
	20	19	19

Summer Requirement: Six weeks' industrial employment.

Senior Year

	F	W	S
Econ. 431—Labor Problems	3	0	0
Econ. 432—Industrial Relations	0	3	0
Econ. 433—Personnel Management	0	0	3
E.E. 320, 321—Elements of Electrical Engineering I	3	3	0
E.E. 325, 326—Elec. Engr. Lab.	1	1	0
I.E. 423—Job Evaluation	3	0	0
I.E. 433—Wage Administration	0	3	0
I.E. 443—Quality Control	0	0	3
I.E. 451, 452, 453—Seminar	1	1	1
Stat. 361—Statistics	3	0	0
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
S.S. 391, 392—Contemporary Problems	0	3	3
**Electives	3	3	3
	20	17	13

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* Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

Professional Study in Industrial Engineering

A fifth, or professional, year of study is offered in Industrial Engineering as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced course work leading to the degree of Industrial Engineer.

Fifth Year Curriculum in Industrial Engineering

	Terms and Credits		
COURSES	F	W	S
I.E. 425—Sales & Distribution	0	0	3
I.E. 515—Process Engineering	3	0	0
I.E. 535—Material Handling	0	0	3
I.E. 541, 542—Advanced Motion & Time Study	3	3	0
I.E. 551, 552—Standard Cost & Budgeting	0	3	3
I.E. 635, 636—Planning for Production	3	3	0
I.E. 671, 672, 673—Seminar	1	1	1
I.E. 681, 682, 683—Project Work	2	2	2
Approved Electives	3	3	3
	15	15	15

Graduate Study in Industrial Engineering

For general regulations, the announcement of the Graduate School should be consulted. Graduate work is offered in Industrial Engineering leading to the degree of M.S. in Industrial Engineering.

FURNITURE MANUFACTURING AND MANAGEMENT

Associate Professor E. Sigurd Johnson, In Charge

Any curriculum in the School of Engineering has as an aim the preparation of men capable of handling the technical problems arising in the job which he undertakes. Where industry is already equipped with qualified engineers, a new employee with a basic engineering education can be given on-the-job training in analyzing and solving the special problems peculiar to the particular plant or industry.

In the case of the furniture industry, practically no experienced engineers exist. To be of service the College must emphasize to a greater extent the application of engineering principles to the problems of the furniture industry. This can be done effectively only if the instructional staff is aware of the problems of the industry from direct contact and not merely from academic discussion and the available literature.

It is the purpose of the curriculum offering the degree of Bachelor of Science in Furniture Manufacturing to prepare graduates for technical and, eventually, executive positions in the furniture industry.

The program has been worked out in conjunction with representatives of the manufacturers. Their viewpoint is based on a survey made among the entire membership of the Southern Furniture Manufacturers' Association. Results of the survey indicate an overwhelming interest in college level training to prepare men for work in this industry.

The curriculum will emphasize the application of engineering to furniture manufacturing. Related subjects covering management, labor relations, accounting, marketing and sales, will stress the technical as well as the human side of modern production methods and techniques.

The Industrial Engineering Department sponsors the Furniture Club. All students in the curriculum are eligible for membership in this organization which is operated by the students. The Furniture Club brings in speakers from the furniture industry and holds social gatherings for the furniture students.

FURNITURE MANUFACTURING AND MANAGEMENT

For the Freshman Year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
For. 201—Wood Structure & Identification	3	0	0
For. 303—Wood Moisture Relations	0	0	3
I.E. 206, 207—Industrial Organization and Management	0	3	3
I.E. 224, 225—Woodworking Equipment	0	3	3
I.E. 227, 228—Machine Tool Laboratory	1	1	0
I.E. 230—Saws and Machine Knives	0	0	1
Phys. 211, 212, 213—General Physics	4	4	4
Psych. 200—Introduction to Psychology	3	0	0
Literature & History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	17	17	20

Junior Year

	F	W	S
Econ. 344, 345—Economic Principles	3	3	0
Econ. 401, 402, 410—Princ. of Accounting and Manufacturing Accounting	3	3	3
E.M. 213—Elements of Mechanics	0	0	3
Eng. 211, 231—Business Correspondence and Public Speaking	0	3	3
For. 421—Log & Lumber Grades	3	0	0
For. 433—Gluing and Plywood	3	0	0
For. 451—Wood Finishing	0	0	3
I.E. 222—Furniture Design & Construction	0	3	0
I.E. 326—Furniture Manufacture & Processing	0	0	4
I.E. 332—Motion & Time Analysis	0	4	0
Tex. 318—Upholstery Fabrics	3	0	0
**Electives	3	3	3
	18	19	19

Senior Year

	F	W	S
Econ. 407—Business Law	0	0	3
Econ. 432, 433—Industrial Relations and Personnel Management	0	3	3
I.E. 341—Furniture Plant Layout	4	0	0
I.E. 408—Production Control	0	4	0
I.E. 423—Job Evaluation	3	0	0
I.E. 433—Wage Administration	0	3	0
I.E. 443—Quality Control	0	0	3
I.E. 451, 452, 453—Seminar	1	1	1
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
s.s. 392, 393—Contemporary Problems	0	3	3
Stat. 361—Intro. to Statistics for Engineers	3	0	0
Technical Electives	3	3	3
**Electives	3	3	3
	20	20	19

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*Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

**The junior and senior electives may be taken in Advanced Military Science or they may be made up on the basis of 12 credits of technical course work and 6 credits of nontechnical course work. Each student should plan the entire 18 elective credits in consultation with his adviser.

THE DEPARTMENT OF MATHEMATICS

Professor H. A. Fisher, Head of the Department

Professors R. C. Bullock, J. W. Cell, J. M. Clarkson, Jack Levine, C. G. Mumford, H. Page Williams, L. S. Winton; Associate Professors C. L. Carroll, Jr., P. E. Lewis, H. M. Nahikian, H. V. Park, C. F. Strobel; Assistant Professors E. J. Canaday, H. C. Cooke, Anna Mae Harris, C. F. Lewis, D. M. Peterson, C. C. Watson, V. R. Brantley, C. H. Little, Jr., A. R. Nolstad; Instructors R. A. Byrd, H. E. Speece, Ruth B. Honeycutt, Esther D. Robinson, S. R. Baker, H. A. Petrea.

Mathematics is one of the basic sciences. At State College, the large and competent Mathematics Department not only teaches the subject as a science but also gives a large amount of drill and practice to the students so that upon completion of the courses the students not only know the subject matter but are skilled and rapid in its use when applied to the problems of technology.

ENGINEERING MATHEMATICS

Graduate Study

A curriculum in Engineering Mathematics will be taken generally by a student who has completed work for the bachelor's degree in some phase of engineering. However, it may be taken also by one who has acquired the Bachelor of Arts degree provided he takes the listed prerequisite courses.

The curriculum is designed for several purposes—to remedy an alarming deficiency in trained teachers in Engineering Mathematics, to provide supplementary courses of a distinguished quality for other Engineering curricula, to foster mutual scholarly attainments with members of other departments, and to provide men for industry with the necessary training to apply advanced mathematics to engineering problems.

For general regulations, the announcement of the Graduate School should be consulted. Graduate work is offered in Engineering Mathematics leading to the degree of Master of Science in Mathematics.

Prerequisites:

a. Drawing—4 credits
b. Mechanics—9 credits
c. Strength of Materials—3 credits
d. Physics—15 credits
e. Differential Equations—3 credits

Required Courses:

COURSES	F	W	S
Math. 511, 512, 513—Advanced Calculus for Engineers	3	3	3
Math. 541—Vector Analysis	0	0	3
Math. 602, 603—Ordinary and Partial Differential Equations	0	3	3
Math. 611—Complex Variable Theory and Applications	3	0	0
Math. 632—Operational Mathematics	0	3	0

A minimum of 21 additional credits shall be required and they shall be selected in consultation with an advisory committee. At least 15 of these 21 hours shall be chosen in either one or two fields of engineering, and representatives of the engineering departments concerned shall be members of the advisory committee.

MECHANICAL ENGINEERING

Professor K. P. Hanson, Head of the Department

Professor Emeritus L. L. Vaughan

Professors H. B. Briggs, J. S. Doolittle, V. M. Faires, E. G. Hoefer, R. B. Knight, R. M. Pinkerton; Associate Professors W. W. Austin, W. S. Bridges, T. C. Brown, J. F. Lee, P. E. Moose; Assistant Professors T. B. Ledbetter, P. B. Leonard, T. J. Martin, Jr., W. M. Neale, Jr., J. K. Whitfield; Instructors M. L. English, Malcolm Lewis, T. L. Nash, J. G. McCracken, E. H. Stinson.

The Mechanical Engineering Department offers a four-year bachelor's program in Mechanical Engineering and in Aeronautical Engineering as an option in the Mechanical field. The curricula in both Mechanical Engineering and the Aeronautical option are accredited by the Engineers' Council for Professional Development.

The mechanical engineer is primarily a designer and builder of machines and other equipment for use in manufacturing processes, transportation, and the generation of power. He is responsible for the conservation and economical use of the power-producing resources of the world through the application of the proper equipment in each field of production. He is called upon to take charge of the management of the manufacturing and power industries. For the mechanical engineer to be well grounded in his profession, he must be thoroughly familiar with both the science and the art of engineering.

The curriculum in Mechanical Engineering begins with a thorough training in mathematics, physics, and chemistry, as a foundation for the technical work which is later developed along several parallel lines. The student is taught how these fundamental sciences are applied to the physical properties of the materials of construction, and to the transformation of heat energy into work and power. This is accomplished by means of courses in theory and through instruction in the various mechanical laboratories.

The curriculum in Aeronautical Engineering (option under Mechanical Engineering) embodies the same basic studies as the Mechanical Engineering program, specializing in Aeronautical sciences in the senior year. Graduates of this curriculum are prepared to take their places in the fields of design, production, and research in the Aeronautical industries.

The primary objective of the Aeronautical Option is to provide a sound general training in subjects fundamental to Aeronautical Engineering. In general, the professional subjects are directed toward aerodynamics and airplane design with special emphasis on the fundamental treatment of aeronautical science; to familiarize the student with the general principles of flight and with the details of design and construction as applied to the airplane. Classroom work is supported by experimental activities in the aeronautical laboratory which offers facilities in wind tunnel, structural, and instrument studies. The first three years of study are, for the most part, devoted to fundamental subjects; the strictly professional work being deferred until the fourth year.

Through the training offered in this department, it is hoped that the young graduate, after gaining some experience in industry, will be qualified to accept the responsibilities which will be imposed upon him in the Mechanical and Aeronautical industries.

CURRICULUM IN MECHANICAL ENGINEERING

For the Freshman Year, refer to page 125

Sophomore Year

COURSES	Terms and Credits		
	F	W	S
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
I.E. 114, 115, 116—Shop Laboratory	1	1	1
Math. 201, 202, 303—Calculus I, II, III	4	4	4
M.E. 201—Descriptive Geometry	0	2	0
M.E. 202—Machine Drawing	0	0	2
Phys. 201, 202, 203—General Physics	5	5	5
Literature and History	3	0	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	18	21

Junior Year

C.E. 203—Surveying I	3	0	0
E.M. 321, 422—Strength of Materials	0	3	3
I.E. 227, 228, 229—Machine Tool Laboratory	1	1	1
M.E. 307, 308, 309—Engineering Thermodynamics	3	3	3
M.E. 313, 314, 315—Mech. Eng. Lab. I	1	1	1
M.E. 317, 318, 319—Kinematics	3	3	3
M.E. 322, 323—Metallurgy	0	3	3
Literature or History	3	0	0
Econ. 344, 345—Economic Principles	0	3	3
**Electives	3	3	3
	17	20	20

Summer requirement: Six weeks' industrial employment.

Senior Year

E.E. 320, 321, 322—Elements of E.E.	3	3	3
E.E. 325, 326, 327—E.E. Laboratory	1	1	1
E.M. 430—Fluid Mechanics	3	0	0
M.E. 401, 402, 403—Power Plants	3	3	3
M.E. 407, 408, 409—Mech. Eng. Lab. II	1	1	1
M.E. 411, 412, 413—Machine Design	3	3	3
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
S.S. 392, 393—Cont. Problems	0	3	3
**Electives	3	3	3
	20	17	17

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* Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The junior and senior electives may be taken in Advanced Military Science or may be selected as follows: 6 credits in nontechnical electives and 12 credits in technical electives. Each student should plan the entire 18 elective credits in consultation with his adviser.

CURRICULUM IN THE AERONAUTICAL OPTION

Mechanical Engineering Department

For the Freshman Year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
E.M. 311, 312, 313—Engineering Mechanics	3	3	3
I.E. 116—Welding Laboratory	1	0	0
Math. 201, 202, 303—Calculus I, II, III	4	4	4
M.E. 201—Descriptive Geometry	0	2	0
M.E. 202—Machine Drawing	0	0	2
Phys. 201, 202, 203—General Physics	5	5	5
Literature and History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	20	20

Junior Year

	F	W	S
Ae.E. 310—Elements of Aero. Eng.	0	0	3
Econ. 344, 345—Economic Principles	3	3	0
E.M. 321, 422—Strength of Materials	0	3	3
E.M. 430—Fluid Mechanics	3	0	0
I.E. 227, 228, 229—Machine Tool Laboratory	1	1	1
Math. 401—Differential Equations	3	0	0
M.E. 307, 308, 309—Engineering Thermodynamics	3	3	3
M.E. 313, 314, 315—Mech. Eng. Lab. I	1	1	1
M.E. 322, 323—Metallurgy	0	3	3
M.E. 327—Mechanisms	3	0	0
**Electives	3	3	3
	20	17	17

Summer requirement: Six weeks' industrial employment.

Senior Year

	F	W	S
Ae.E. 421, 422, 423—Airplane Design	3	3	3
Ae.E. 431, 432, 433—Aerodynamics	3	3	3
Ae.E. 441, 442, 443—Aeronautical Lab.	1	1	1
Dies. 507, 508, 509—Internal Combustion Engines	3	3	3
E.E. 320, 321—Elements of E.E.	3	3	0
E.E. 325, 326—E.E. Lab.	1	1	0
P.S. 351 or Soc. 343—Political Science or Soc.	3	0	0
S.S. 392, 393—Contemporary Problems	0	3	3
**Electives	3	3	3
	20	20	16

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* Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The junior and senior electives may be taken in Advanced Military Science or may be selected as follows: 6 credits in nontechnical electives and 12 credits in technical electives. Each student should plan the entire 18 elective credits in consultation with his adviser.

HEATING AND AIR CONDITIONING

The Mechanical Engineering Department offers a four-year program in Heating and Air Conditioning leading to the degree of Bachelor of Science in Heating and Air Conditioning.

The objective of the program is to train young men in this specialized field and prepare them to take positions in industry in the design, construction, and operation of heating, ventilating, and air conditioning systems as well as the management of such industries and sales representatives of companies manufacturing equipment for the trade.

The curriculum has the first year common with the regular engineering program and starts specialization in the second year. Sufficient basic science courses are required in the first years to establish a firm foundation for the more technical courses in the latter years. Training is accomplished by lecture, recitation, and demonstration work with a liberal inclusion of laboratory work illustrating the theory and drawing attention to the practical aspects of the subject. Provision is made for the more liberal aspects of college education through the humanities courses. Electives in the junior and senior years for those who do not choose advanced Military Science allow further liberal or technical education in any group of courses which will meet with the objectives of the individual.

HEATING AND AIR CONDITIONING CURRICULUM

For the Freshman Year, refer to page 125

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Econ. 401, 402—Principles of Accounting	3	3	0
E.M. 213—Elements of Mechanics	0	0	3
Eng. 231—Public Speaking	0	0	3
I.A. 215—Sheet Metal	0	1	0
I.E. 169—Welding and Pipe Shopwork	0	1	0
I.E. 227—Machine Tool Laboratory	1	0	0
Math. 201—Calculus I	4	0	0
M.E. 271, 272—Mechanical Drawing	2	2	0
M.E. 273—Piping Drawings	0	0	2
Phys. 211, 212, 213—General Physics	4	4	4
Literature and History	3	3	3
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	17	18

Junior Year

	F	W	S
C.E. 355—Details of Building Construction	3	0	0
Econ. 344, 345—Economic Principles	0	3	3
Econ. 407—Business Law	0	0	3
E.M. 325—Elementary Strength of Materials	3	0	0
E.M. 335—Fluid Flow	0	3	0
E.E. 340, 341, 342—Industrial Electricity	3	3	3
E.E. 345, 346, 347—Industrial Electricity Lab.	1	1	1
Eng. 211—Business Correspondence	3	0	0
M.E. 371, 372—Fundamentals of Gases and Vapors	3	3	0
M.E. 373—Fundamentals of Steam Power Plants	0	0	3
M.E. 375, 376, 377—Mechanical Laboratory	1	1	1
M.E. 379—Mechanical Equipment of Buildings	0	0	3
**Electives	3	3	3
	20	17	20

Summer Requirement: Six weeks' industrial employment.

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* Students excused from Freshman and Sophomore Military Science and/or Physical Education will schedule equivalent credits in courses outside their department.

** The junior and senior electives may be taken in Advanced Military Science or may be selected as follows: 6 credits in nontechnical electives and 12 credits in technical electives. Each student should plan the entire 18 elective credits in consultation with his adviser.

Senior Year

COURSES	Terms and Credits F	W	S
C.E. 453—Contracts and Specifications	0	0	3
Econ. 432—Industrial Relations	0	3	0
I.E. 206—Industrial Organization and Management	3	0	0
I.E. 425—Sales and Distribution Methods	0	0	3
M.E. 381, 382, 383—Principles of Heating and Air Conditioning	3	3	3
M.E. 385, 386, 387—Heating and Air Conditioning Design	3	3	3
M.E. 391, 392—Principles and Applications of Refrigeration	3	3	0
M.E. 393, 394, 395—Heating and Air Conditioning Lab.	1	1	1
P.S. 351 or Soc. 343—Political Science or Sociology	3	0	0
S.S. 392, 393—Contemporary Problems	0	3	3
**Electives	3	3	3
	19	19	19

** The junior and senior electives may be taken in Advanced Military Science or may be selected as follows: 6 credits in nontechnical electives and 12 credits in technical course work. **Each student should plan the entire 18 elective credits in consultation with his adviser.**

Professional Study in Mechanical Engineering

A fifth, or professional, year of study is offered in Mechanical Engineering, as a continuation of the four-year undergraduate program. This fifth year of study offers specialized and advanced work leading to the degree of Mechanical Engineer.

Fifth Year Curricula in Mechanical Engineering

Heat-Power

	F	W	S
Dies..405—Internal Combustion Engines	3	0	0
M.E. 527—Lubrication	0	0	3
M.E. 551, 552, 553—Project Work in Mech. Engineering	2	2	2
M.E. 556—Refrigeration	0	3	0
M.E. 576—Gas Turbines	0	3	0
M.E. 577—Heat Transfer	0	0	3
M.E. 601, 602, 603—Mechanical Engr. Seminar	1	1	1
M.E. 671—Advanced Engr. Thermodynamics	3	0	0
M.E. 681, 682, 683—Advanced Power Plants	3	3	3
Approved Electives	3	3	3
	15	15	15

Design

	F	W	S
E.M. 554—Vibration Problems	0	0	3
Math. 401—Differential Equations	3	0	0
M.E. 525, 526—Experimental Stress Analysis	3	3	0
M.E. 527—Lubrication	0	0	3
M.E. 545—Metallurgical Factors in Design	0	3	0
M.E. 551, 552, 553—Project Work in Mech. Engr.	2	2	2
M.E. 601, 602, 603—Mechanical Engr. Seminar	1	1	1
M.E. 611, 612, 613—Advanced Machine Design	3	3	3
Approved Electives	3	3	3
	15	15	15

Aeronautical

	F	W	S
Ae.E. 566—Flight Test Techniques	0	0	3
Ae.E. 571, 572, 573—Theory & Design of Aircraft Structures	3	3	3
Ae.E. 664—Aircraft Applied Loads	3	0	0
Ae.E. 665—Flying Qualities	0	3	0
M.E. 551, 552, 553—Project Work in Mech. Engr.	2	2	2
M.E. 601, 602, 603—Mech. Engr. Seminar	1	1	1
Approved Electives	3	3	3
	15	15	15

GRADUATE STUDY IN MECHANICAL ENGINEERING

For general regulations, the announcement of the Graduate School in this catalog should be consulted. Graduate work is offered in Mechanical Engineering leading to the degree of M.S. in M.E.

THE SCHOOL OF FORESTRY

Richard J. Preston, Dean

Professor J. V. Hofmann, Director Emeritus and Manager North Carolina Forestry Foundation
Professors J. S. Bethel, R. C. Bryant, R. M. Carter, C. E. Libby, T. E. Maki, L. Wyman
Associate Professors W. D. Miller, G. K. Slocum
Instructor D. A. Stecher

The School of Forestry offers undergraduate instruction in the fields of Forest Management, Wood Technology, Pulp and Paper Technology, and Lumber Products Manufacturing and Merchandising. The Bachelor of Science degree is granted upon completion of the four-year curricula in these fields. Graduate work is offered to meet the needs of two classes of students. The degree of Master of Forestry or Master of Wood Technology is designed for students desiring a thorough professional background, while the degree Master of Science in these two fields is designed for those desiring specialization in fields of scientific research.

The curricula of the School of Forestry provide a broad training in the physical and biological sciences as well as a sound cultural background. Sufficient elective courses are provided to permit a limited amount of specialization. Specialized fields within the profession of forestry make professional preparation beyond the four-year course desirable and qualified students are urged to plan a five-year program leading to the Master's degree.

The Profession of Forestry

While forestry has been recognized and practiced for centuries in Europe, this profession is relatively new in the United States, dating from about the beginning of the present century. During the period of rapid expansion and development of our country the forests were badly neglected and abused. Now, however, with our timber supplies depleted and the value of timber products increasing, sound forest practices have been accepted as economically desirable and feasible. Increasing the productivity and quality of our forests is basic to the welfare of the Southeast. The importance of the forest resource in the economy of North Carolina is brought out by the fact that fifty-nine per cent of the land area is in forest with wood products industries ranking next to textiles as a source of industrial employment.

Forestry may be divided into the two major professional fields of forest management and wood utilization, both of which are closely related and interdependent. Forest management deals with all phases of the management of wild lands and includes such related subjects as grazing, water-shed protection, and recreation. In order to be adequately prepared for work of this diverse nature, the forest manager must be trained in such subjects as silviculture, timber estimating, management, fire prevention and control, forest pathology, insect control, forest soils, economics, and other aspects of land use.

Three courses of study are available in the field of wood utilization. Wood technology, dealing with the technical aspects of utilization, includes training for all types of wood using and wood manufacturing industries. It incorporates technical and practical principles of logging, milling, seasoning, gluing, preserving, finishing, fabricating and machining; and includes the fundamentals of sound business administration.

Pulp and paper technology trains men for work in the pulp plants. Students are given thorough training in chemistry, mathematics, physics, wood structure and properties, pulping processes and chemical engineering subjects related to pulp and paper manufacturing. In addition sufficient work in forest management is included to give a reasonable understanding of the problems of wood procurement.

Lumber products manufacturing and merchandising covers the distribution, selling and use of lumber and products made from wood. This curriculum combines a broad background of business administration with a sound knowledge of the product being handled.

Employment Opportunities

A wide and rapidly expanding field of employment possibilities is available in the Southeast to young men trained in forestry. Until recent years most job opportunities were with government agencies in managing our public forests, and this still constitutes a major source of employment. These agencies include state and federal forest services, extension services, and other groups such as the Soil Conservation Service and the Tennessee Valley Authority.

In recent years job opportunities with private industries have expanded greatly. Increasing numbers of technically trained young men are entering a wide variety of professional positions in the fields of forest land management, watershed management, logging, sawmilling, veneer and plywood manufacturing, pulp and paper making, kiln drying, wood preservation, plastics and other chemical derivatives of wood, and the manufacture of wood products such as furniture, dimension stock, and various prefabricated items.

The merchandising of lumber and lumber products offers numerous opportunities for students qualified for sales, business administration, or small building construction. Sawmills and lumber yards, plywood and paper manufacturers, and flooring, wallboard, and other forest products plants need trained men.

Exceptional students will find opportunities for employment in research or teaching. This type of work ordinarily requires a graduate degree. There has been an increasing demand for well-trained woodlands managers and wood technologists, as well as for research workers in government experiment stations and laboratories.

Eighty per cent of the graduates of the School of Forestry are now employed in some field of forest or wood products work and it is hoped to increase this percentage in the future. The few students who have not followed the forestry profession have found their college education sufficiently broad to provide a sound basis for a wide variety of work.

FACILITIES AND PROGRAMS

The offices of the School of Forestry together with some classrooms and laboratories are located in the new Forestry Building.

Wood Products Laboratory.—The Wood Products Laboratory is housed on the first floor of the new Forestry Building and in separate buildings on Western Boulevard. This laboratory contains general wood shop equipment, a veneer lathe and clipper, glue mixers and spreaders, tape machine and hot presses, testing equipment, preservation tanks, a modern dry kiln, and two portable sawmills. This equipment, available for teaching, student experience and research, provides an unexcelled laboratory for practical production processing of dimension stock, furniture, plywood and other wood products.

School Forests.—The School of Forestry, with more than 82,000 acres of forest land available and three permanent field camps, has facilities unexcelled in many respects for field instruction and research.

The Hofmann Forest, owned and operated by the North Carolina Forestry Foundation for the benefit of the School of Forestry, consists of approximately 80,000 acres located in Jones and Onslow Counties in the southeastern portion of the state. Pond and loblolly pine together with hardwood and cypress swamps characterize this tract. Half of the spring quarter of the Senior year is spent in the permanent camp located on this forest.

The George Watts Hill Demonstration Forest is a tract of 1500 acres located sixteen miles north of Durham. This typically piedmont forest of rolling terrain contains stands of loblolly, short-leaf and Virginia pines along with numerous hardwoods. The permanent summer camp for sophomores is located on this area.

The Long Creek Forest of 11,000 acres belonging to Mrs. Elizabeth D. Reynolds is located eighteen miles northeast of Elkin. Facilities on this forest are available for instruction and research. Half of the spring quarter of the senior year and a part of the Sophomore summer camp is held in permanent quarters on this mountain tract.

The Richland Creek Farm Forest of 300 acres located four miles northwest of the campus is being developed into a model farm forest and is used for field instruction near the campus.

The School nursery, located on the campus, is fully equipped for instructional purposes and the production of planting stock.

Field Instruction and Experience.—All students are required to present a minimum of one summer of acceptable work experience in order to meet graduation requirements. Students are required to consult with their advisors as to what types of employment will be acceptable.

The ten-week Sophomore summer camp on the Hill and Long Creek forests is a prerequisite for Junior standing and is a general requirement for students in the School of Forestry. Students in the Forest Management curriculum are also required to attend the camp on the Hofmann and Long Creek forests during the spring quarter of the Senior year. Permanent, well equipped camps are maintained on these coastal, piedmont and mountain forests. A "C" average is required for admission to these camps.

Additional field instruction and scheduled trips to representative wood industries are required of all students as a part of their class assignments. To cover the costs of this off-campus training all students enrolled in the School of Forestry pay a field laboratory fee of $10.00 each year at the time they first register during a school year. Room rent of $20.00 is charged for both the summer and spring camps.

Short Courses.—In cooperation with the College Extension Division and other departments of State College, short courses are offered to personnel in wood-using industries. These courses vary from a few days to a few weeks in length and cover such subjects as aerial photo interpretation, lumber merchandising, seasoning and kiln drying, lumber grading, gluing, quality control, wood preservation, and wood finishing. Additional courses in other fields of forestry will be offered as the need arises. In addition to the faculty of the School of Forestry, experts from the trade association, federal laboratories, and private industry are called in to furnish instruction. Class and laboratory facilities of State College are available for these courses. These vocational courses provide to men in industry an opportunity to keep abreast of modern developments in methods and equipment.

FELLOWSHIPS, SCHOLARSHIPS, AND LOAN FUNDS

A limited number of research assistantships and teaching fellowships are available to qualified graduate students. Students interested in applying should correspond with the Dean.

The Hulda Johnson Cox Forestry Scholarship was established by the Ralph K. Cox Paper Company of Wellsburg, West Virginia and Dover, North Carolina. This scholarship is to honor the wife of the founder of the company. It carries an annual award of $500.00 and is awarded by the faculty of the School of Forestry to an outstanding student at the beginning of his junior year.

The Hofmann Loan Fund was established by alumni of the School of Forestry to honor Dr. J. V. Hofmann, the first Director of the Division. Loans to worthy students are available through this fund as well as through the Student Loan Fund established by the State College Alumni Association.

CURRICULA OFFERED IN THE SCHOOL OF FORESTRY

Curricula are offered in the School of Forestry to prepare students for professional employment in the various fields of forest management, wood technology, pulp technology, and lumber products manufacturing and merchandising. All curricula have a common freshman year, thus enabling students to postpone selection of their major field until they have an opportunity to become acquainted with its scope and possibilities.

Freshman Year in All Forestry Curricula

COURSES	Terms and Credits F	W	S
*Bot. 101, 102, 203—General and Systematic Botany	4	4	3
**Chem. 201, 202—General Inorganic Chemistry	0	5	5
Eng. 101, 102, 103—Composition	3	3	3
For. 101, 102—Forestry and Conservation	2	0	2
***Math 111, 112, 123—Algebra, Trig., Analytical Geom.	4	4	4
Pol. Sc. 211—American Government	3	0	0
****Mil. Sci. 101, 102, 103 or Air Science 121, 122, 123	2	2	2
P.E. 101, 102, 103—Phys. Educ. and Hygiene	1	1	1
	19	19	20

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*Students electing a utilization curriculum will substitute Psy. 200, General Psychology for Bot. 203.

**Chemistry will be taken in the freshman year if student makes a "C" average during Fall Term and has passed either Retarded Algebra or Math 111.

***Students electing the Forest Management or Lumber Products Manufacturing and Merchandising curricula should substitute Math 113, Math of Finance for Math 123.

****Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses in the Humanities or Social Sciences.

FOREST MANAGEMENT CURRICULUM

Prof. T. E. Maki, In Charge

Forest Management is the application of sound forestry principles in the woods. The forest manager considers individual trees, stands, types, and entire forests. The field of forest management requires a knowledge of the botanical relationships within the forest and how to control and use these relationships, which is silviculture. It includes the economic factors concerned in the business side of forestry and the methods of measuring forest products and forest stands.

The curriculum provides for a broad basic training and also includes 25 elective credits to permit limited specialization. It trains men for positions with pulp companies, lumber companies and other private landowners; federal and state forest services; agricultural extension; and for private enterprise as a consultant, forest landowner, or sawmill operator.

In addition to the sophomore summer camp, management students spend the spring quarter of the senior year in camps on school forests. A "C" average is the minimum requirement for attendance at the camps.

All students graduating from this curriculum will be required to have a minimum of one summer's acceptable work experience.

This curriculum leads to the degree of Bachelor of Science in Forest Management. A minimum of 240 credits is required for graduation.

CURRICULUM IN FOREST MANAGEMENT

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Agron. 201—Soils	0	5	0
Bot. 211, 213—Dendrology	3	3	0
Chem. 203—Organic Chemistry	5	0	0
C. E. 208, 209—Surveying and Mapping	4	4	0
For. 201—Wood Structure and Identification	3	0	0
Geol. 120—Physical Geology	0	0	4
Physics 215—General Physics	0	0	5
S.S. 101, 102—Contemporary Civilization	0	3	3
Zool. 102—General Zoology	0	0	4
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	18	18	19

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*Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses in the Humanities or Social Sciences.

Summer Camp

COURSES	Credits
Surveying and Mapping, C.E. s300	3
Silviculture, For. s204	3
Dendrology, For. s214	1
Mensuration, For. s274	3
Wood-Using Industries, For. s284	2
	12

Junior Year

Bot. 421—Plant Physiology	5	0	0
Econ. 301, 302—General Economics	0	3	3
English Elective and Eng. 321—Technical Writing	0	3	3
Ent. 311—Introduction to Forest Insects	4	0	0
For. 361—Silvics	0	0	3
For. 372—Mensuration	0	5	0
Pl. Path. 318—Diseases of Forest Trees	4	0	0
S.S. 103—Contemporary Civilization	3	0	0
Stat. 311—Introduction to Statistics	0	0	4
Zool. 312—Game Management	0	0	3
Electives	3	9	3
	19	20	19

Senior Year

Bot. 541—Plant Ecology	3	0	0
English Elective	0	3	0
For. 313—Forest Industries	0	0	3
For. 333—Management Plans	0	0	4
For. 343—Forest Protection and Improvements	0	0	3
For. 363—Field Silviculture	0	0	4
For. 373—Forest Inventory	0	0	4
For. 423—Logging	3	0	0
For. 501—Forest Valuation	4	0	0
For. 511—Regional Silviculture	5	0	0
For. 512—Forest Economics	0	3	0
For. 531—Forest Management	0	5	0
For. 553—Forest Photogrammetry	0	3	0
Electives	5	5	0
	20	19	18*

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*The spring quarter of the Senior year is held in the forestry camps.

WOOD TECHNOLOGY CURRICULUM

Prof. R. M. Carter, In Charge

Wood technology deals with the utilization and characteristics of all forms of wood material obtained from the log or from the chemical constituents of the wood, and the products that may be derived from or made out of wood. It involves a basic knowledge of the structure of wood, and its physical, mechanical, and chemical properties or characteristics. This understanding is combined with experience in practical methods of conversion or manufacturing. Acquiring a familiarity with the details of the manufacturing processes, the necessary equipment, and the principles of operation is part of the training program.

The curriculum is designed to supply the fundamental information needed in all types of industries from the sawmill to the paper mill. It provides for 20 elective credits to meet the student's special interests. There are promising opportunities for employment with wood-using industries in such positions as research or quality control technicians, dry kiln or plant superintendents, or managers and operators of such industries as sawmills, wood treating plants, veneer and plywood plants, furniture plants, boat yards, dimension plants, adhesive companies, wood machinery plants, and factories making such materials as wallboard, roofing felt and fiber products.

All students graduating from this curriculum will be required to have a minimum of one summer's acceptable work experience.

This curriculum leads to the degree Bachelor of Science in Wood Technology. A minimum of 240 credits is required for graduation.

CURRICULUM IN WOOD TECHNOLOGY

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Chem. 103—Qualitative Analysis	4	0	0
C.E. 203—Surveying	0	0	3
Eng. 231—Public Speaking	0	3	0
For. 201—Wood Structure and Identification	3	0	0
For. 302—Physical Properties of Wood	0	0	3
I.E. 224, 225—Woodworking Equipment	0	3	3
Math 211, 212, 213—Calculus	3	3	3
M.E. 101, 102,—Engineering Drawing	2	2	0
Physics 201, 202, 203—General Physics	5	5	5
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	19	20

Summer Camp

COURSES	Credits
Surveying and Mapping, C.E. s300	3
Silviculture, For. s204	3
Dendrology, For. s214	1
Mensuration, For. s274	3
Wood-Using Industries, For. s284	2
	12

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*Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses in the Humanities or Social Sciences.

Junior Year

	Terms and Credits		
COURSES	F	W	S
Chem. 425, 426—Organic Chemistry	4	4	0
Econ. 301, 302—General Economics	0	3	3
Eng. 211, 321—Business Corres. and Tech. Writing	3	0	3
For. 303—Wood-Moisture Relations	0	0	3
For. 421—Log and Lumber Grades	3	0	0
For. 422—Forest Products	0	3	0
For. 442—Lumber and Dimension Stock Mfg.	3	0	0
I.E. 206, 207—Industrial Organization and Management	0	3	3
S.S. 101, 102, 103—Contemporary Civilization	3	3	3
Electives	3	3	3
	19	19	18

Senior Year

	F	W	S
Econ. 407—Business Law	0	3	0
For. 401—Preservation and Waste Reduction	0	0	4
For. 402—Foundations of Forest Management	0	3	0
For. 423—Logging	3	0	0
For. 433—Gluing and Plywood	3	0	0
For. 443—Wood Finishing	0	0	3
For. 512—Forest Economics	0	3	0
For. 513—Tropical Woods	0	0	3
For. 523—Furniture Construction & Assembly	0	3	0
For. 533—Adv. Wood Structure & Identification	3	0	0
For. 541—Mechanical Properties of Wood	3	0	0
For. 543—Pulping Processes and Products	0	3	0
For. 563—Quality Control	0	0	3
Stat. 361, 301—Statistics for Engineers and Lab.	4	0	0
Electives	3	3	5
	19	18	18

PULP AND PAPER TECHNOLOGY CURRICULUM

Professor C. E. Libby, In Charge

In recent years the pulp and paper industry has become one of the most important wood using industries in the Southeast. The pulp and paper companies through their woodlands or procurement departments are now one of the largest employers in the South of the graduates of forest schools. Most of these men have been trained in forest management for woods work. There are also many opportunities in this industry for individuals with technical training in all phases of pulp and paper technology, particularly the pulping and pulp purification processes as well as the many complex operations concerned with the actual manufacture of paper itself.

The pulp and paper technology curriculum offered by the School of Forestry at North Carolina State College is designed to train men for work in connection with the mechanical and chemical utilization of wood in the mills of pulp and paper companies. This curriculum developed in cooperation with the Departments of Chemistry and Chemical Engineering emphasizes the basic sciences essential to technical training in pulp and paper manufacture. It includes a thorough study of the wood pulping processes, chemical and by-product recovery, pulp bleaching and the various papermaking operations like refining, sizing, filling, coloring, coating and converting. Graduates are qualified for work in mill laboratory and quality control departments and for general plant production jobs. High scholarship students are urged to undertake graduate study after obtaining the Bachelor's degree continuing either at this college or elsewhere in schools of papermaking, chemistry or chemical engineering.

All students majoring in this curriculum are excused from the sophomore summer camp required of other forestry students but are required to spend this summer working in a pulp or paper mill where arrangements have been made by the college for such employment. Three hours of academic credit are granted the student after completion of 12 weeks of mill work and presentation of a satisfactory report covering this work experience. In addition to this minimum summer work requirement, students are urged to work in mills the two remaining summers between academic years because of the great value of practical experience in this industry.

This curriculum leads to the degree Bachelor of Science in Pulp and Paper Technology. A minimum of 237 credits is required for graduation.

CURRICULUM IN PULP AND PAPER TECHNOLOGY

Sophomore Year

	Terms and Credits		
COURSES	F	W	S
Chem. 103, 212, 211—Qualitative and Quantative Analysis	4	4	4
Eng. 231, 321—Public Speaking and Technical Writing	0	3	3
For. 201—Wood Structure and Identification	3	0	0
Math. 211, 212, 213—Calculus	3	3	3
M.E. 101, 102, 103—Engineering Drawing	2	2	2
Physics 210, 202, 203—General Physics	5	5	5
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	20	20

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*Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses in the Humanities or Social Sciences.

SOPHOMORE SUMMER SESSION

For. 591—Forestry Problems .... 3 credits

Junior Year

COURSES	F	W	S
Ch. E. 205—Chemical Process Principles	0	0	3
Ch.E. 301, 302—Elements of Chemical Engineering	3	3	0
Chem. 213—Quantitative Analysis	0	0	4
Chem. 425, 426—Organic Chemistry	4	4	0
Chem. 531, 532—Physical Chemistry	4	4	0
E.E. 320, 321—Electrical Engineering Elements	0	3	3
E.E. 325, 326—Electrical Engineering Laboratory	0	1	1
For. 321, 322, 323—Pulp and Paper Technology	3	3	3
For. 542—Fiber Analysis	3	0	0
Psy. 337—Industrial Psychology I	0	0	3
Electives	3	3	3
	20	21	20

Senior Year

COURSES	F	W	S
Chem. 563—Chemistry of Carbohydrates	0	0	3
Econ. 301, 302—General Economics	3	3	0
For. 403—Paper Technology Laboratory	0	0	3
For. 411—Pulp and Paper Making Machinery	3	0	0
For. 413—Paper Testing Laboratory	0	0	3
For. 451—Paper Coloring	2	0	0
For. 461—Paper Converting	0	3	0
For. 463—Mill Inspections	0	0	1
For. 471, 473—Pulp Technology Laboratory	3	3	0
For. 482, 483—Pulp and Paper Mill Management	0	2	2
For. 491, 492—Pulp Testing Laboratory	1	1	0
For. 592, 593—Forestry Problems	0	1	3
Psy. 338—Industrial Psychology II	3	0	0
English Elective	0	3	0
Electives	3	3	3
	18	19	18

LUMBER PRODUCTS MANUFACTURING AND MERCHANDISING CURRICULUM

Professor R. M. Carter, In Charge

The distribution of lumber and other wood products and their proper utilization comprises the third curriculum of the wood technology-utilization branch of forestry. It is intended to fill the need for personnel trained both in business methods and in the basic characteristics and properties of the products and structures made out of wood. Methods of manufacturing, merchandising, business administration, preparation of plans and specifications, and a knowledge of other building materials form an integral part of the curriculum.

This curriculum trains men in light building construction, wood products manufacturing and merchandising for a wide variety of production and marketing positions with sawmills retail and wholesale lumber yards or brokerage firms; plywood and paper manufacturers; roofing felt, wallboard, flooring and furniture plants and industries providing trade outlets for other wood products and associated materials. Provision is made for 32 elective credits to meet the student's special interests.

All students graduating from this curriculum will be required to have a minimum of one summer's acceptable work experience.

This curriculum leads to the degree Bachelor of Science in Lumber Products Manufacturing and Merchandising. A minimum of 240 credits is required for graduation.

CURRICULUM IN LUMBER PRODUCTS MANUFACTURING AND MERCHANDISING

Sophomore Year

COURSES	Terms and Credits F	W	S
Chem. 203—Organic Chemistry	5	0	0
C.E. 208, 209—Surveying and Mapping	4	4	0
Econ. 301, 302, 303—General Economics	3	3	3
Eng. 211, 231—Business Corr. & Public Speaking	0	3	3
For. 201—Wood Structure and Identification	3	0	0
For. 302—Physical Properties of Wood	0	0	3
I.E. 224, 225—Woodworking Equipment	0	3	3
M.E. 101, 102—Engineering Drawing	2	2	0
Physics 215—General Physics	0	0	5
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	20	18	20

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*Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses in the Humanities or Social Sciences.

Summer Camp

COURSES	Credits
Surveying and Mapping, C.E. s300	3
Silviculture, For. s204	3
Dendrology, For. s214	1
Mensuration, For. s274	3
Wood-Using Industries, For. s284	2
	12

Junior Year

COURSES	Terms and Credits F	W	S
Econ. 401, 402, 410—Accounting	3	3	3
For. 303—Wood Moisture Relations	0	0	3
For. 401—Preservation & Waste Reduction	0	0	4
For. 402—Foundations of Forest Management	0	3	0
For. 421—Log and Lumber Grades	3	0	0
For. 422—Forest Products	0	3	0
For. 442—Lumber and Dimension Stock Mfg.	3	0	0
S.S. 101, 102, 103—Contemporary Civilization	3	3	3
Electives	6	6	6
	18	18	19

Senior Year

COURSES	F	W	S
Econ. 407—Business Law	0	0	3
Econ. 432—Industrial Relations	0	3	0
Econ. 433—Personnel Management	0	0	3
Eng. 321—Technical Writing	3	0	0
For. 432—Merchandising Forest Products	0	3	0
For. 433—Gluing and Plywood	3	0	0
For. 443—Wood Finishing	0	0	3
For. 453—Lumber Structures	0	3	0
For. 512—Forest Economics	0	3	0
For. 523—Furniture Construction and Assembly	0	3	0
For. 541—Mechanical Properties of Wood	3	0	0
For. 563—Quality Control	0	0	3
Psy. 338—Industrial Psychology II	3	0	0
Stat. 361, 301—Statistics for Eng. and Lab.	4	0	0
Electives	3	4	7
	19	19	19

THE SCHOOL OF TEXTILES

Malcolm E. Campbell, Dean
Thomas Nelson, Dean Emeritus
Thomas R. Hart, Director of Instruction

Organization.—The School of Textiles of North Carolina State College is organized into five departments for the purpose of administration: Yarn Manufacturing, Knitting, Fabric Development and Construction, Textile Chemistry, and Textile Research.

The School of Textiles is organized to offer technical instruction, both undergraduate and graduate, in the applied sciences underlying the production and finishing of textile products. This training is supplemented by thorough academic and engineering training in the other branches of the college. In addition it is organized and equipped to conduct applied and fundamental textile research, and it also cooperates with other Schools of the College and with research organizations throughout the country.

Purpose.—The purpose of the School of Textiles is to educate men for professional service in all phases of the textile industry; to develop their capacities for intelligent leadership; to equip them to participate in commercial and public affairs; to aid in the development of the textile industry and its commerce through research and experimentation; to cooperate with the textile mills of the State in gaining, through scientific research, information that will improve the quality and value of manufactured products and increase technical skill.

Textile Building.—The present building, built in 1939, was designed to harmonize the needs of teaching with the requirements of laboratories to allow the best possible instruction and research in technical textile processes in their many ramifications. Due to the increase in enrollment as well as to the rapid expansion of new developments in the industry, increased floor space has been added. Two new wings have allowed expansion of the laboratories on a functional basis and provided floor space to cover the needs of the expanded program in many new fields of endeavor by the School of Textiles.

Occupations.—Never before in America have more opportunities in textiles been offered to young people of North Carolina and the South generally than are available today to graduates of the School of Textiles.

North Carolina is the largest textile manufacturing State in the South; it has more mills than any other State in America. It has the largest towel, damask, denim, and underwear mills in America; and it has more mills that dye and finish their own products than any other Southern State, also a large printing industry. These plants produce a diversified line of cotton, synthetic, silk, wool, and worsted textile products.

The courses of instruction are arranged and grouped so that students may get the best results from their work, and accumulate the necessary knowledge, which, together with actual experience after graduation, enables them to fill such positions as the following:

Owners of mills.

Presidents and vice-presidents of mills and other textile establishments.

Secretaries and treasurers of mills.

Managers, superintendents, and department foremen in cotton, synthetic, woolen, silk, and hosiery mills.

Superintendents and foremen in mercerizing, bleaching, dyeing, and finishing plants.

Directors of Quality Control Departments.

Designers and analysts of fabrics.

Technical demonstrators in the dyestuff industry.

Textile chemists.

Textile cost accountants in mills.

Purchasing agents for mills.

Salesmen of machinery, yarn, cloth, synthetics, dyestuffs, and chemicals.

Positions in yarn and fabric commission houses, with fabric converters and with research organizations.

Specialists in Government service.

Representatives for manufacturers of machinery, synthetics, dyestuffs, and mill supplies.

Degrees.—Upon the completion of any one of the options in Textiles, the degree of Bachelor of Science in Textiles is conferred.

Upon the completion of the curriculum in Textile Chemistry, the degree of Bachelor of Science in Textile Chemistry is conferred.

The degree of Master of Science in Textiles or of Master of Science in Textile Chemistry is offered for the satisfactory completion of one year of graduate study in residence. Candidates for the degree of Master of Science enter and are enrolled in the Graduate Division of the College.

Inspection Trips.—For certain of the textile courses offered, it is deemed advantageous for the student to see the manufacturing process under actual operating conditions. Therefore, when possible, trips are arranged for student groups to visit outstanding manufacturing plants. When so arranged, such trips are compulsory; transportation costs and other travel expenses, while held to a minimum insofar as possible, must be paid by the student.

Curricula.—Two curricula, Textiles, and Textile Chemistry, are offered in the School of Textiles. The freshman year is the same in both. Seven options are provided for seniors in the Textiles curriculum which permit the student to specialize in a chosen field. The options include groups of related courses which represent, in each case, a total of thirty credits. The options are: General Textiles, Knitting, Quality Control, Synthetics, Textile Management, Weaving and Designing, and Yarn Manufacturing.

Textile Curricula for University and College Graduates. Selected courses leading to the degree Bachelor of Science in Textiles are offered to graduates of universities and standard colleges. These are arranged in accordance with the vocational aim of the individual student and in the light of credits presented from the institution by which the student has been graduated, subject to the approval of his adviser and the director of instruction. In cases where the student presents enough credits which may be used for courses required in a curriculum, he or she may be graduated with a Bachelor of Science degree in Textiles in one year. In no case should it take more than two years, plus one or two summer schools to complete the work for the degree.

Short Courses.—It is the policy of the School to offer short course training for textile mill men who have a limited amount of time to spend at the School. These courses can be offered when a demand for them exists and the subject matter will be selected to meet the needs of the group.

Extension Courses.—The staff of the School is cooperating with the Extension Division of the College in offering textile courses by correspondence to employees of textile mills who wish to engage in this type of study. Applications for enrollment in these courses should be mailed direct to the College Extension Division, Edward W. Ruggles, Director, State College Station.

DEPARTMENTS

YARN MANUFACTURING

Professor Elliot B. Grover, Head of the Department

Professor J. T. Hilton
Associate Professor R. D. Bunn
Associate Professor D. S. Hamby
Instructors J. S. Parker, W. E. Smith, W. C. Stuckey, Jr.
Laboratory Technician Mrs. Barbara S. Gast

Purpose.—The purpose of this Department is to instruct students in the theory and practice of producing yarns; to conduct experimental processing in the utilization of cotton, wool, and the various synthetic fibers, and combinations of these; to study the engineering aspects of the machinery involved; and to cooperate with mills in solving manufacturing problems through research and experimentation.

Opening and Picking.—The opening and picking equipment, located in a separate humidified laboratory, consists of two lines of equipment. First, a completely coordinated line consisting of blending feeders, openers, and a one-process picker is arranged so as to allow full scale production with by-passes provided for man-made staple fibers and experimental work. Second, individual breaker and finisher pickers for processing samples.

Carding Section.—A laboratory equipped for carding, combing, drawing and related processes is located in one large humidified laboratory. The machinery consists of different types of cards, regular and controlled draft drawing, and combing machinery suitable for processing a wide range of materials from carded cotton to synthetics and wool on the cotton system.

Roving Section.—A complete group of roving frames including conventional as well as controlled or long draft types is located in another separate laboratory.

Yarn Section.—The yarn section laboratory contains equipment for spinning, twisting, and winding. In order to conserve room and to have as many types of equipment as possible, the machinery in this section has been built in shorter-than-standard lengths, but complete in every other respect. Practically all industrial types of drafting are represented, both in demonstration units and operating equipment. Sample installations are available of overhead cleaning, Pneumafil, roll buffing, different types of spindles, and of many other modern developments. Included also in the department are several types of twisters and many of the standard types of winders equipped to wind skeins, cones, dye packages, or tubes.

Research Laboratories.—Three separate laboratories for applied research in fiber processing are located in the yarn department. These are described in the section under Research.

Continuous Filament Laboratory.—A laboratory completely equipped for the processing of continuous filament synthetic yarns from soaking through winding is enclosed in another separate humidified room. This laboratory has the complete range of equipment necessary for the processing of crepe, voile and hosiery yarn, and includes: soaking tub, extractor, dryer, twist-setting oven, spooler, upstroke twisters, doubler twister, quill winder, cone winders and nylon sizing machine plus supplementary equipment.

Wool Section.—An entirely new laboratory has been set up for the processing of wool and long-staple synthetic fibers and blends. Included in the equipment is a Davis and Furber Wool Unit, complete from machinery to handle blending through the warping of the spun yarn. A Warner and Swasey Pin Drafter has recently been added, and other modern equipment is being planned for addition. Courses in processing wool are included in the catalogue.

Physical Testing Laboratories.—There are three separate air-conditioned laboratories, one of which is used for teaching and undergraduate student work, and another for industrial research and graduate student research.

The third laboratory, which has a separate air-conditioning unit, is used for fundamental and applied research where it is necessary to have atmospheric conditions varying from the standard.

The laboratories are equipped for the physical testing of fibers, yarns and fabrics. Included in the laboratory equipment are the following: a complete range of fiber testing equipment, Instron tester, several torsion and other types of balances, several combination skein and fabric breaking machines, inclined plane testers, single strand pendulum testers, Moscrop multiple single strand testers, bursting strength testers, drying ovens, abrasion machines, twist testers, densometers, hydrostatic pressure tester, automatic reels, permeability testers, evenness testers and many other types of laboratory equipment, both commercial and special instruments developed at the school.

The option in Yarn Manufacture is listed with the other options.

KNITTING

Professor William E. Shinn, Head of the Department

Associate Professor J. G. Lewis
Instructor E. T. Harrill, Jr.

Purpose.—In recognition of the great importance of knitting and the other needle arts in the industrial life of this section, a department of knitting has been set up with the objective of making available to this branch of the textile industry, personnel more adequately trained in the fundamentals and practices underlying the production of knitted textiles.

The laboratories of the knitting department, organized and equipped for instruction in many phases of the knit-goods industry, are grouped as follows:

Seamless Hosiery Section.—The equipment for instruction in seamless hosiery production includes representative types of machines arranged in two groups. The more elementary types, including ribbers and plain hosiery machines with the elementary attachments such as stripers, reverse plating and rubber top attachments are arranged together for beginning students. The more advanced types are grouped together for advanced students. This line includes advanced rib type machines, Komets, Banner Wrap Reverse, several types of float stitch machines and machines for the manufacture of hosiery with ornamental wrap patterns.

Nylon Hosiery Section.—This section is equipped with three full fashioned hosiery knitting machines of modern types, in 45-gauge, 51-gauge, and 54-gauge respectively. There is provided also a 400-needle women's nylon hosiery machine of the circular type. This equipment forms the basis for instruction in the general course in hosiery manufacture and for the more advanced instruction in full fashioned hosiery production. Equipment for the looping and seaming of hosiery, for preboarding, dyeing, and finishing of fine hosiery is provided in separate rooms.

Circular Knitwear Section.—A wide assortment of large diameter fabric knitting machines is provided for demonstration and instruction in the production of cloth for both underwear and outerwear. This group includes both latch needle, and spring needle types for jersey, rib, interlock, and Jacquard fabric.

Garment Cutting and Seaming.—A laboratory for experimental garment design and manufacture has been set up with modern power cutting equipment, and many types of industrial sewing machines for producing garments for both outerwear and underwear. This unit is supplemented by knit goods finishing equipment located in the hosiery and knitwear finishing laboratory.

Warp Knitting, Flat Knitting.—The knitting department laboratories include five warp knitting machines of the tricot and raschel types. These machines furnish the basis for instruction in the design, analysis, and production of a wide range of warp knitted fabrics. A collection of fabrics and several winding and warp preparation machines make it possible to process a wide variety of materials. Flat machines of the V-bed and links-and-links types are employed for instruction in the production of heavier knitwear such as sweaters.

Knit Goods Finishing Laboratory.—The department has a laboratory devoted entirely to experimental work in hosiery and knit goods finishing. This laboratory contains modern equipment for pre-boarding, dyeing and finishing machinery, a knit goods calender for finishing knitted tubing, a fabric brush, and an experimental warp sizing machine for the preparation of warp yarns for tricot knitting.

FABRIC DEVELOPMENT AND CONSTRUCTION

Professor Benjamin L. Whittier, Head of the Department

Associate Professor J. A. Porter, Jr.
Associate Professor W. E. Moser
Assistant Professor J. B. Gaither
Assistant Professor E. B. Berry

Purpose.—The purpose of this Department is to instruct students in the theory and practice of weaving and designing fabrics ranging from simple print cloths to elaborate leno and jacquard creations; to coöperate with the home economics department of North Carolina colleges in creating consumer interest in textile products; to coöperate with mills in solving manufacturing problems through research and experimentation.

Weave Room.—This room contains a larger variety of looms than can be found in a textile, carefully selected so that the students may obtain knowledge of the different looms made in the United States. On this equipment are produced all types of fabrics including print cloths, denims, sateens, ginghams, fancy shirting, dobby weave dress and drapery materials, pile, leno, and jacquard fabrics, woven from natural and synthetic fibers. The weave room is completely humidified.

Warp Preparation.—The equipment for preparing yarn for weaving is located in a separate department. This equipment includes a modern high speed warper and a rayon type slasher as well as auxiliary equipment such as skein, cone, and filling winders. There is also a silk type combination warper and beamer used for making short warps for student instruction. There is a separate room for drawing-in warps.

Designing and Fabric Analysis.—A full equipment of design boards for single and double cloths is provided in the classrooms. Dies for cutting samples and different makes of balances, and microscopes are provided for the analysis of fabrics. Other designing equipment includes an enlarging camera, card cutting pianos and card lacing equipment.

Cloth Inspection.—Modern equipment for inspection has been placed in a separate room where students can learn the technique of grading woven materials.

The option in Weaving and Designing is listed with the other options.

TEXTILE CHEMISTRY

Professor Henry A. Rutherford, Head of the Department

Professor K. S. Campbell
Associate Professor A. C. Hayes
Assistant Professor R. C. Davis
Research Assistant J. G. Templeton

Purpose.—The purpose of this Department is to instruct students in the chemistry of natural and synthetic fibers, and in the theory and practice of scouring, bleaching, dyeing, finishing, and printing of yarns and fabrics; to conduct laboratory experimental work demonstrating the principles set forth in lecture periods; to cooperate with the mills of the State in solving problems relating to the wet processing of textile materials.

Dyeing Laboratory.—This is a complete laboratory, modern in every respect, with generous provision for bench space, equipment storage facilities, utilities, and steam baths for each student. It is used for all laboratory work dealing with chemical properties of textiles, dye synthesis, color matching, and all types of dyeing.

Dye House.—In this room is assembled one of the finest groups of dyeing and finishing machinery for instructional and experimental purposes in existence anywhere. Obtained over the last three or four years at a cost of over $150,000, the equipment includes a singeing machine, a continuous dyeing range of the pad-steam type, a Williams unit, a du Pont-type continuous bleaching unit, four package dyeing machines, a dye beck, dye jig, rotary hosiery dyeing machine, and piece goods dyeing and finishing units utilizing dry cans, an enclosed tenter frame, and a continuous loop drying and curing unit supplied with both steam and gas fired heat sources.

Microscopy.—Excellent facilities are available for work in textile microscopy. The laboratory contains the most modern instruments including microscopes, cross-sectioning devices, and equipment for photomicrography. In addition to the ordinary monocular microscope, the binocular and polarizing types are available. The dark room contains everything needed for photographic work.

Research and Textile Chemical Analysis.—Two laboratories equipped for chemical research on fibers and on textile chemical specialities are available. These are used by advanced undergraduates and graduate students for working on special problems and for research. The equipment includes a reflectometer, a spectrophotometer with all supplementary apparatus, colorimeters, and the common testing equipment used for evaluation, colorfastness, washfastness, etc., of dyed fibers and fabrics.

The curriculum in Textile Chemistry is listed with the other Textile curricula. Changes in the requirements for students selecting this curriculum may be anticipated from time to time in order that the academic training may be kept abreast of modern developments in the application of chemistry to textile materials.

TEXTILE RESEARCH

William Andrews Newell, Coordinator
Professor J. F. Bogdan, Head, Processing Research
Associate Professor Ivan Yen-Ta Feng—Research Associate
Laboratory Technician P. C. Kochhar
Research Technician Helene Payet
Laboratory Assistant J. J. Gajda

Through financial assistance extended by the North Carolina Textile Foundation, a program of research has been initiated which is far-reaching in its influence on the development of the textile industry in North Carolina and the nation.

The scope of this research embraces applied and fundamental investigations in the fields of fibers, yarn, fabrics, textile chemistry, fabrication, machinery.

Research is carried out by a full-time research staff trained in the physical sciences with the assistance of department heads and the members of the teaching staff.

Equipment for processing and chemical research is available in eight laboratories, four of which are devoted entirely to research. In addition, equipment used for instruction can also be employed if needed. Complete spinning units are available for manufacture of yarns on the cotton, woolen, and worsted systems.

The research department also carries out training of students on both undergraduate and graduate levels by direct participation in the instructional program and by furnishing part-time employment to these students.

SYNTHETIC FIBERS DIVISION

Purpose.—The purpose of this division is to acquaint students with the various types of synthetic yarn, and to instruct in the basic properties, handling methods, and conversion into representative end products of each. The division acts in conjunction with the knitting, yarn manufacturing, weaving, textile chemistry, and research departments of the School of Textiles to provide a broad ground work in synthetic yarn fundamentals.

Laboratories are coordinated with and are a part of the laboratories of the Department of Yarn Manufacturing, Fabric Development and Construction and Knitting.

The Synthetic Fiber option is listed with other options.

MACHINE DESIGN AND DEVELOPMENT

C. M. Asbill, Jr., Head
C. E. Cox, Toolmaker
J. C. Groff, Equipment Custodian

Purpose.—The purposes of this Department are as follows:

1. To develop new types of textile machinery and to improve existing types.
2. To keep abreast of modern developments in machines and testing equipment by a digest of patents, technical articles in the various textile publications, as well as by close contacts with mills and machine manufacturers.
3. To furnish engineering assistance and advice relating to patents to individuals and organizations interested in the design or development of textile machines or related apparatus.
4. To place within reach of and at the disposal of interested students and the teaching and research staff of the School, the facilities of a qualified textile engineering department with means for the construction and testing of new or improved equipment.

Equipment.—The facilities consist of design and drafting equipment together with a completely equipped machine shop for the production of both large production machines, and smaller and more delicate testing apparatus.

The establishment of this Department within the School of Textiles was made possible by the financial assistance of the N. C. Textile Foundation. Its functions will extend to all phases of textile manufacturing and processing including both the mechanical and electrical fields. Patents will be secured on all worthwhile developments and administered in accordance with the Patent Policy of the College.

TEXTILE LIBRARY

Miss Katharine McDiarmid, Librarian

The School of Textiles has a technical library located on the main floor.

As a result of a substantial gift by the Burlington Mills Corporation the Textile Library has been relocated in the Textile Building. The new, enlarged quarters which were designed to incorporate the latest functional provements were ready for occupancy in the Fall of 1951.

The library was organized in 1944 and in June, 1945, the entire textile collection from the D. H. Hill Library was added to it. There are now about 2000 volumes of which 1000 are bound periodicals. The library subscribes to 75 current periodicals, both American and foreign, which are very thoroughly indexed in Industrial Arts Index, Chemical Abstracts, Natural and Synthetic Fibers, and Textile Technology Digest.

In addition to books and periodicals, the librarian and student assistants maintain files of pamphlets, reprints, trade catalogs, and patents. Special card indexes have been prepared for these collections.

The holdings of the Textile Library are available on loan not only to students and faculty of the college, but also to research workers and industrial employees throughout North Carolina.

CONSULTING SERVICE

George H. Dunlap, Textile Consultant

In recognition of the need for close contact with the textile mills, this division was organized with the assistance of the North Carolina Textile Foundation. It is the function of the Technologist to visit as many mills as possible during the year, to discuss with executives their technical problems, and assist in their solution. In many cases, this involves experimental work which may be conducted in the mill or brought to the School for consultation with the staff or for special work in the laboratories.

The Technologist frequently cooperates with the officials of trade associations in planning and arranging programs and represents the School at these meetings.

TEXTILE PLACEMENT BUREAU

George H. Dunlap, Director

The Placement Bureau is a clearing house for students in the graduating class and textile alumni. It is a coordinating agency for the employer and the graduates of the School of Textiles. The Placement Bureau tries to keep an accurate file of all textile alumni and the progress they have made. Therefore, all alumni are requested to notify the Director every time they receive a promotion or transfer from one organization to another.

SPONSORED PROFESSORSHIPS

Four sponsored professorships are now in effect in the School of Textiles. These are made possible by funds contributed to the North Carolina Textile Foundation, Inc., and especially designated to pay a part of the annual salary of the professor selected to fill the position.

The four professorships, together with the year of establishment and the name of the incumbent for each are as follows:

Burlington Mills Professorship of Textiles (1946).

Edgar and Emily Hesslein Professorship of Fabric Development and Construction (1948)—Benjamin Lincoln Whittier, Professor of Textiles and Head, Department of Fabric Development and Construction.

Chester H. Roth Professorship of Knitting (1948)—William Edward Shinn, Professor of Textiles and Head, Department of Knitting.

Abel C. Lineberger Professorship of Yarn Manufacturing (1948)—Elliot Brown Grover, Professor of Textiles and Head, Department of Yarn Manufacturing.

CURRICULUM IN TEXTILES

Freshman Year

(For All Textile Students)

	Terms and Credits		
COURSES	F	W	S
Chem. 101, 102—General Inorganic Chemistry	4	4	0
Chem. 105—General Chemistry	0	0	4
Des. 106—Design Principles	2	0	0
Eng. 101, 102, 103—Composition	3	3	3
Math. 111, 112—Algebra, Trigonometry	4	4	0
Math. 123—Analytical Geometry	0	0	4
M.E. 101, 102, 103—Engineering Drawing	2	2	2
Tex. 108—Yarn Principles	0	3	0
Tex. 131—Fabric Principles	0	0	3
*Mil. Science 101, 102, 103 or Air Science 121, 122, 123	2	2	2
*P.E. 101, 102, 103—Physical Education & Hygiene	1	1	1
	18	19	19

Sophomore Year

(For All Except Textile Chemistry Students)

Econ. 301, 302, 303—General Economics	3	3	3
**English	3	3	3
Hist. 121, 122—U. S. History	3	3	0
Phys. 211, 212, 213—General Physics	4	4	4
Tex. 206, 207—Yarn Manufacture II	0	3	3
Tex. 233, 234—Weaving II	2	0	2
Tex. 237—Fabric Structure	0	2	0
Tex. 261—Knitting	2	0	0
Tex. 267, 268, 269—Knitting Laboratory	1	1	1
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	21	22	19

Junior Year

Econ. 401, 402, 403—Principles of Accounting or Psychology 200, 337, 338	3	3	3
Econ. 425, 426—Industrial Management	3	3	0
Econ. 433—Personnel Management	0	0	3
Tex. 307, 308—Yarn Manufacture II	3	0	3
Tex. 316—Textile Testing I	3	0	0
Tex. 335, 336—Weaving III	3	3	0
Tex. 341, 342—Dobby Design I, Fabric Analysis I	0	3	3
Tex. 420, 421—Fiber Quality I, II	0	3	3
T.C. 301, 302, 303—Textile Chemistry I	3	3	3
Electives	3	3	3
	21	21	21

Senior Year

Pol. Sc. 211—American Government	0	3	0
Tex. 426, 427—Mill Organization	0	3	3
***Tex. 470—Textile Cost Methods	3	0	0
****Tex. 477—Hosiery Manufacture	3	0	0
Tex. 599—Instrumentation & Control	0	3	0
T.C. 410—Textile Microscopy	0	0	2
SELECTED OPTION: (30 Credits in General Textiles, Knitting Synthetics, Textile Management, Weaving & Designing, or Yarn Manufacturing) See Options	12	9	9
Electives	3	3	3
	21	21	17

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

** If approved in advance by the Director of Instruction, students who average C or above on Composition, English 101, 2, 3, may substitute 9 credits of Modern Language.

*** Students in Management Option will substitute an approved textile course.

****Knitting option students should schedule this in junior year.

OPTIONS

General Textiles Option

	Terms and Credits		
COURSES	F	W	S
Tex. 345—Fabric Technology	0	0	3
Tex. 407, 408—Yarn Manufacture IV	3	3	0
Tex. 416—Wool Manufacture I	0	0	3
Tex. 437—Weaving Laboratory IV	2	0	0
Tex. 443—Dobby Design II	3	0	0
Tex. 451—Fabric Analysis II	2	0	0
Tex. 490—Synthetics I	0	3	0
Textile Courses	2	3	3
	12	9	9

Knitting Option

Tex. 371, 372—Knitted Fabric Design	2	2	0
Tex. 460—Knitting Mechanics	0	3	0
Tex. 463, 464, 465—Knitted Garment Laboratory	2	2	2
Tex. 468—Flat Knitting	3	0	0
Tex. 469—Tricot Knitting	0	0	3
Tex. 471—Full-fashioned Hosiery Knitting	0	0	2
Tex. 473, 474, 475—Knitting Laboratory II	2	2	2
Textile Course	3	0	0
	12	9	9

Quality Control Option

Stat. 361—Statistics for Engineers	3	0	0
Stat. 301, 302, 303—Statistical Laboratory	1	1	1
Tex. 411, 412—Testing & Quality Control	4	4	0
Tex. 509—Textile Testing II	0	0	3
Tex. 414, 415..Development Project	0	2	2
Textile Courses	3	3	3
	11	10	9

Synthetics Option

Tex. 404, 405—Synthetic Fiber Processing	3	3	0
Tex. 424—Yarn Technology	0	0	3
Tex. 491, 492, 493—Synthetics II	3	3	3
T.C. 409—Fabric Finishing I	3	0	0
Textile Courses	3	3	3
	12	9	9

Textile Management Option

Econ. 411, 412, 413—Marketing Methods & Sales Management	3	3	3
Econ. 504, 505—Principles of Cost Accounting	3	3	0
Textile Courses	6	3	6
	12	9	9

Weaving and Designing Option

Tex. 345—Fabric Technology	3	0	0
Tex. 437, 438—Weaving Laboratory IV, V	2	2	0
Tex. 443, 544—Dobby Design II, III	3	3	0
Tex. 445—Jacquard Design	0	3	0
Tex. 451—Fabric Analysis II	2	0	0
Tex. 455—Color in Woven Design	3	0	0
Tex. 490—Synthetics I	0	0	3
Tex. 535—Weaving VI	0	0	3
Tex. 546—Jacquard Design & Weaving	0	0	3
	13	8	9

Yarn Manufacturing Option

COURSES	Terms and Credits F	 W	 S
Tex. 404, 405—Synthetic Fiber Processing	3	3	0
Tex. 407, 408—Yarn Manufacture IV	3	3	0
Tex. 416—Wool Manufacturing I	3	0	0
Tex. 424—Yarn Technology	0	0	3
Tex. 490—Synthetics I	3	0	0
Tex. 515—Yarn Manufacturing Project	0	0	3
Textile Courses	0	3	3
	12	9	9

CURRICULUM IN TEXTILE CHEMISTRY

(The freshman year is the same as for the Textiles Curriculum)

Sophomore Year

Chem. 103—Qualitative Analysis	4	0	0
Chem. 211, 212—Quantitative Analysis	0	4	4
History 121, 122—U. S. History	3	3	0
Math. 211, 212, 313—Calculus A, B, C	3	3	3
Phys. 211, 212, 213—General Physics	4	4	4
Pol. Sc. 211—American Government	0	0	3
Tex. 203—Textile Yarns	0	0	3
Tex. 233, 234—Weaving II	2	2	0
Tex. 237—Fabric Structure	0	2	0
*Military Science II or Air Science II	2	2	2
*P.E. 201, 202, 203—Physical Education	1	1	1
	19	21	20

Junior Year

Chem. 421, 422, 433—Organic Chemistry	5	5	5
Econ. 301, 302, 303—General Economics	3	3	3
Eng. 231—Public Speaking	3	0	0
**English	3	3	3
Tex. 316—Textile Testing I	0	3	0
Tex. 599—Instrumentation & Control	0	0	3
T.C. 305, 306, 307—Textile Chemistry II	4	4	4
T.C. 410—Textile Microscopy	2	0	0
Electives	3	3	3
	23	21	21

Senior Year

Econ. 425, 426—Industrial Management	3	3	0
Econ. 433—Personnel Management	0	0	3
Eng. 321—Technical Writing	3	0	0
Tex. 420—Fiber Quality I	0	3	0
T.C. 405, 406, 407—Textile Chemistry & Dyeing II	4	4	4
T.C. 409—Fabric Finishing II	0	0	4
T.C. 414, 415—Textile Printing	0	3	3
T.C. 520, 521—Chemistry of Fibers	3	3	0
Electives	3	3	3
***Electives	5	0	2
	21	19	19

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* Students excused from Military Science and/or Physical Education will schedule equivalent credits in courses from the following departments: Economics, English, History and Political Science, Modern Languages, Philosophy and Religion, Psychology, Rural Sociology, Social Studies, and Sociology.

** If approved in advance by the Director of Instruction, students who average C or above on Composition, English 101, 102, 103, may substitute 9 credits of French or German.

*** Chemistry, Textiles, Mathematics, Statistics or Physics.

The Graduate School of the University of North Carolina

STATE COLLEGE DIVISION

William Whatley Pierson, Jr., Dean, Chapel Hill

Donald Benton Anderson, Associate Dean, Raleigh

The Graduate School of the Consolidated University of North Carolina is composed of three divisions, one at each of the three units of the University System. The Consolidated Graduate School is administered by the Graduate Dean, the three Associate Deans and a Graduate Council composed of representatives of each of the units of the Consolidated University.

At State College graduate instruction is organized to provide opportunity and facilities for advanced study and research in the fields of Agriculture, Engineering, Forestry, Technological Education, and Textiles. The Master of Science degree is offered in each of these areas. The Master's degree in a professional field is offered in Agriculture, Forestry, and Technological Education. The Master's degree in a professional field is intended for students who are interested in the more advanced applications of fundamental principles to specialized fields rather than in the acquisition of the broader background in advanced scientific studies which would fit them for careers in research.

The degree of Doctor of Philosophy is offered in the following departments:

Engineering Physics
Entomology
Experimental Statistics
Nuclear Engineering
Plant Pathology
Rural Sociology
Zoology (in the fields of ecology and wildlife conservation)
Agricultural Economics
Agronomy
Animal Industry
Botany (in the fields of physiology and ecology)
Ceramic Engineering
Chemical Engineering
Electrical Engineering

Students interested in graduate study should consult the Graduate School catalog. A copy will be sent upon request. Address—Associate Dean, Graduate School, North Carolina State College, Raleigh, N. C.

DIVISION OF COLLEGE EXTENSION

Edward W. Ruggles, Director

Purpose.—The College Extension Division is organized to carry the practical and cultural advantage of college studies to persons who cannot attend classes on the campus, and to groups and communities which may profit by the service offered through the following means.

Extension Classes are organized where at least fifteen persons are interested and willing to take up the same subject. Such matters as the distance from the college, the nature of the subject, and the availability of instructors must be taken into consideration.

Correspondence Courses for college credit are offered in Agronomy, Animal Husbandry, Horticulture, Soils, Poultry, Agricultural Economics, Rural Sociology, Education, Economics, English, Geology, History, Architecture, Ceramic Engineering, Mechanical Engineering, Mathematics, Modern languages, Sociology, Statistics, Safety, Social Studies, and Zoology. The list of these courses is being added to as rapidly as possible. Complete information concerning them is included in the Bulletin of Correspondence Courses.

Correspondence Courses of a practical nature are offered in Mathematics, Land Surveying, Engineering Drawing, Building and Estimating, Industrial Statistics and Quality Control, Poultry, and Vegetable Gardening. In addition, the courses in Ceramic Engineering may be taken as practical where no credit is desired.

Short Courses are offered by the Division of College Extension to tie in the facilities of the several Schools of State College with the trades and industries of North Carolina into a permanent educational program. In carrying out this program, Short courses of a practical nature which are increasing in popularity are offered every year. During the present school year the following short courses and institutes are scheduled: Electrical Meters, Engineers, Surveyors, Gas-Plant Operators, Dry Kiln Operators, Beef Cattle Conference, Dairy Conference, Statistical Quality Control, Furniture Finishing, Sawmill Operators, Grain Marketing, Farm Income Tax, Salt Water Sports Fishing Institute, Pest Control Operators, Water Works School, Industrial Waste Conference, Personnel Testing Institute, State Parks Short Course, Industrial Management, Industrial Safety, Motion and Time Study, Job Evaluation, Introduction to Quality Control, Industrial Relations, Seedsmen's School, Pesticide School, Farm Managers, Diesel Operation and Maintenance, Freezer Locker Operators, Cotton Classing, Lumber Grading, Aerial Photo Interpretation, Commercial Flower Growers School, Beef Production, State Garden Schools, Dairy Production, Dairy Manufacturing, Nurserymen's School, Artificial Breeding, Field Crops Production, Dairy Herd Testing, Refrigeration, Radio, Frequency Modulation, Nutrition School, and a Safety School. Additional courses are being added as the demand arises.

Technical Institutes. The Gaston Technical Institute at Gastonia, N. C. offers five one-year terminal technical courses. The courses are to train young men interested in the electrical, radio, telephone, metal working, wood-working, sheet metal, building, automotive, Diesel, heating, and other industries where technical training is essential to success.

The five courses are: Building Construction Technology, Drafting and Mechanical Technology, Electrical Technology, Internal Combustion Engines (gasoline-Diesel), and Textile Technology.

The Institute is a functional part of North Carolina State College. It is operated by the Division of College Extension under the auspices of the School of Engineering. A special catalog is available on request.

The North Carolina Driver Training School is conducted by the Division of College Extension in cooperation with the School of Engineering. Drivers and driver training instructors for the Motor Transport Industry are trained in this School. A bulletin giving complete information concerning this School and its functions is available.

Bulletins describing the various functions of the Division will be gladly supplied on request. Write to Edward W. Ruggles, Director, Division of College Extension, North Carolina State College, Raleigh, North Carolina.

For Additional Information. Any person interested in extension classes or correspondence courses should write to the Division of College Extension requesting the Extension Bulletin, which contains complete information concerning methods of instruction, fees, and the conditions upon which College credit will be granted.

IV. DESCRIPTION OF COURSES

AGRICULTURAL ECONOMICS

Courses for Undergraduates

Credits and Terms Offered

Agr. Econ. 221. Survey of Agricultural Industries. 3-0-0

The characteristics and importance of foodstuff production and consumption in the United States; distinctive features, type, location, size, function, and problems of the major agricultural industries in the United States.

Mr. Freund.

Agr. Econ. 303. Farm Management I. 4-0 or 4

Prerequisites: Econ. 301, 302.

Fundamental principles of farm organization and operation as a basis for economic decision regarding enterprise combinations, scale of operations and combinations of the production factors; development of practical farm plans for the effective utilization of land, labor, and all items of capital equipment; and keeping and interpreting farm records as an aid to economic decisions in farming. Messrs. Brown and Pierce.

Agr. Econ. 311. Farm Marketing I 4 or 4-0

Prerequisite: Agr. Econ. 303.

A study of buying and selling decisions faced by the farmer; price making forces in agricultural markets; organization and functioning of marketing systems in agriculture. Staff.

Agr. Econ. 413. Farm Appraisal. 0-0-3

Prerequisite: Agr. Econ. 303.

The fundamentals of farm appraisal and practical methods of evaluating farms of various types and sizes. Mr. James.

Agr. Econ. 422. Agricultural Cooperation. 0-3-0

Prerequisite: Agr. Econ. 311.

Cooperative principles and practices, organization problems, and operating practices, as applied to farmers' buying, selling, and service cooperatives.

Staff.

Agr. Econ. 431. Agricultural Prices. 3-0-0

Prerequisite: Agr. Econ. 311.

Behavior of agricultural prices; their relation to consumption, production of farm products, and marketing practices; methods of price analysis applied to agricultural products. Mr. Pierce.

Agr. Econ. 432. Agricultural Finance. 0-3-0

Prerequisite: Agr. Econ. 303.

Types and sources of agricultural credit used in financing the production and marketing of agricultural products; analysis of the credit structure in agriculture and the need for credit in agricultural development. Mr. Pierce.

Agr. Econ. 442. Marketing Field Crops. 0-4-0

Prerequisite: Agr. Econ. 303.

A study of buying and selling decisions faced by the farmer growing field crops; price making forces in agricultural markets; practices and problems in connection with the marketing of cotton, tobacco, grain, and oil seeds. Staff.

Agr. Econ. 462. Marketing Dairy Products. 0-3-0

Channels of distribution and consumption, price plans and bases of price quotations, factors affecting efficiency of plant operation and distribution, Federal regulation of milk marketing, and a review of dairy marketing research. Staff.

Agr. Econ. 464. Marketing Fruits and Vegetables. 0-4-0

Prerequisite: Agr. Econ. 303.

Trends in consumption and production, channels of distribution, sales methods, marketing agencies and facilities, economic implications of prepackaging, and the role of State and Federal agencies. **Staff.**

Agr. Econ. 472. Marketing Livestock and Meats. 0-4-0

Prerequisite: Agr. Econ. 303.

This course is designed to give an understanding of the types and nature of livestock markets and marketing agencies; the influence of grade, quality, seasonality of sale, and market outlet on price and price differentials; principal practices followed in selling livestock in the Southern States; and extent of governmental regulation and supervision of livestock marketing. Emphasis will be placed on livestock marketing problems in the South as they affect farm income and marketing costs. Staff.

Agr. Econ. 502. Monetary and Fiscal Policies in Relation to Agriculture. 0-3-0

Prerequisite: Consent of Instructor.

Economic theory underlying monetary and fiscal policies; the interrelationships between monetary and fiscal policy and agricultural production, prices and incomes; introduction to the analysis of the relationships among the economic aggregates—national income, employment, production, consumption, interest, wage levels, prices, etc., and the analysis of their fluctuations. Mr. Martin.

Courses for Graduates and Advanced Undergraduates

Agr. Econ. 512. Land Economics. 3-0-0

Prerequisite: Agr. Econ. 303.

Theoretical aspects of the supply and utilization of land; analysis of the economic problems connected with farm tenancy, soil conservation, and the transfer of property. Mr. Freund.

Agr. Econ. 521. Farm Marketing II. 0-3-0

Prerequisite: Agr. Econ. 311.

Examination of farm marketing problems and critical evaluation of marketing methods and practices. Mr. King.

Agr. Econ. 523. Farm Management II. 0-0-3

Prerequisite: Agr. Econ. 303.

The application of fundamental principles involved in the theory of the firm to the problems of farm organization and operation; use of production functions in economic analysis as a basis for managerial decisions; the development of county agricultural programs. Mr. James.

Agr. Econ. 533. Agricultural Policy. 0-0-3

Prerequisite: Agr. Econ. 311.

The historical development of agricultural policies and action programs of the Federal Government from 1929 to date; the economic significance of the basic policy concepts involved, such as parity, market supports, acreage control, and soil conservation; the functions and effects of the programs under changing economic conditions and from the viewpoints of special farm groups, regions, and the economy as a whole. Mr. Freund.

Agr. Econ. 551, 552, 553. Agricultural Economics. 3-3-3

Prerequisites: Econ. 301, 302 and Agr. Econ. 303, or equivalent.

An intermediate course in economic principles and their application to agriculture. Emphasis will be placed on the development of the tools and concepts necessary for economic analysis, and an attainment of facility in their use in analyzing economic problems in agriculture.

Messrs. King, Bishop and Martin.

Courses for Graduates Only

Agr. Econ. 602. International Trade in Relation to Agriculture. 0-0-3

Prerequisite: Agr. Econ. 502.

A thorough discussion of the principles of international trade, and interregional differentiation in the use of productive resources, will be followed by the analysis of contemporary problems of trade relationships between countries heavily engaged in the import or export of agricultural products. Attention will be given to the United States and her position in the world economy today, and to recent attempts at regularizing the trade in staple products among the free nations. Mr. Freund.

Agr. Econ. 621. Research in Agricultural Economics.

Credits by arrangement

Prerequisites: Fifteen hours in Economics and Agricultural Economics.

A consideration of the research method and procedure now being employed by research workers in the field of Agricultural Economics, including qualitative and quantitative, inductive and deductive methods of research procedure; choice of projects, planning, and execution of the research project.

A maximum of nine credits is allowed toward the Master's degree.

Staff.

Agr. Econ. 631. Economic and Social Foundations of Agricultural Policy. 3 or 3-0

Prerequisites: Agr. Econ. 551, 552, and 553, or consent of Instructor.

A review of fundamental issues of policies of Western Economies, analysis of policy making processes, interdependency among economic, social, and political behavior in agriculture, and an introduction to the economic consequences of particular programs. Mr. McPherson.

Agr. Econ. 632. Wage, Price, and Production Policies in Industry and Their Effects on Agriculture. 0-3 or 3

Prerequisites: Agr. Econ. 502, 631.

Theories of wages and employment, collective bargaining, and wage differentials. Industrial organization in the economy, price and production policies, integration, costs and prices in the cycle, and government policy and workable competition. Direct and indirect effects of labor and monopoly policies upon the employment of resources, national income and its distribution, and price levels, wages, and interest rates; and upon economic magnitudes in agriculture. Mr. Martin.

Agr. Econ. 633. Welfare Effects of Agricultural Policies and Programs. 3-0 or 3

Prerequisites: Agr. Econ. 502, 642, or equivalent and consent of instructor.

Description of the conditions defining optimal resource allocation. Application of the conditions for maximum welfare in appraisal of economic policies and programs affecting resource allocation, income distribution, and economic development. Mr. Bishop.

Agr. Econ. 641. Economics of Consumption and Demand. 3 or 3-0

Prerequisites: Agr. Econ. 551 or permission of the Head of the Department of Agricultural Economics.

Issues in scope and methods in economic analysis; analysis of consumer behavior with regard to preference patterns and income expenditure, and aggregate demand; demand analysis with special consideration to agricultural commodities. Mr. King.

Agr. Econ. 642. Economics of Production. 0-3 or 3

Prerequisites: Agr. Econ. 641, or consent of Instructor.

Producer behavior with regard to factor combination, quantity and kind of output, and aggregate supply; supply analysis with particular reference to agriculture. Mr. McPherson.

Agr. Econ. 643. Economics of Markets and General Economic Interdependency. 3-0 or 3

Prerequisites: Agr. Econ. 641 and Agr. Econ. 642.

Economic analysis of product and factor markets, price formation, income distribution and their general interdependencies. Mr. James.

Agr. Econ. 651, 652, 653. Analysis of Economic Development in Agriculture. 3-3-3

Prerequisites: Agr. Econ. 641, 642, 643, or equivalent.

A study of the conditions necessary for, and the processes of, economic progress of the individual farm and family and the economy; an analysis of the causes and consequences of continuous economic change—changes in technology, in factor supply, institutions, and in the structure of consumption; effects of rates of economic change on the level and pattern of employment, production, income and consumption, particularly in agriculture. Messrs. McPherson, Bishop and King.

Agr. Econ. 661, 662, 663. Seminar in Contemporary Economic Problems in Agriculture. 3-3-3

Prerequisite: Permission of Head of the Department of Agricultural Economics.

A critical review of the character and the causes of contemporary economic problems in agriculture with an appraisal of current and alternative means of handling these problems. Messrs. Forster, Freund, and James.

AGRICULTURAL EDUCATION

Ed. 313. Organizing Programs of Vocational Agriculture. 0-3 or 3

A study of the aims and objectives of vocational agriculture; the duties and responsibilities of the teacher of agriculture; selecting the course of study; planning the content and procedures; preparing the teaching calendar. Messrs. Armstrong, James.

Ed. 407. Methods of Teaching Vocational Agriculture. 3 or 3

A study of the techniques, the selection of reference materials, supplies, apparatus and equipment needed for teaching vocational agriculture; promoting F.F.A. programs; guiding students in selecting and conducting farming programs; organizing programs for out-of-school groups.

Messrs. Armstrong, James.

Ed. 411. Student Teaching in Agriculture. 15 or 15 or 15

Prerequisites: Ed. 313, 407.

Students will spend one quarter observing, planning and teaching vocational agriculture in all-day, young farmer and adult farmer classes. This course also provides instruction and participating experience in the other activities which characterize a comprehensive program of vocational agriculture. During the summer, prior to the year in which students register for student teaching, they shall spend two weeks in a department of vocational agriculture. It is recommended that one week be spent in the selected high school community before the school term begins and the other week immediately following the opening of the school term. This course will be conducted under the supervision of the members of the Department of Agricultural Education and the supervising teachers in the selected centers. Staff.

Ed. 430. Senior Seminar. 0-1 or 1

Prerequisites: Senior standing in agricultural education, permission to register.

Problems in teaching developing from experience in student teaching.
Mr. Scarborough.

COURSES FOR GRADUATES AND ADVANCED UNDERGRADUATES

Ed. 554. Planning Local Programs of Vocational Agriculture. 3 or 3 or 3

Consideration of the community as a unit for planning programs in agricultural education; objectives and evaluation of community programs; use of advisory groups; school and community relationships; organization of the department and use of facilities; the role of the FFA. Designed for teachers in service, particularly beginning teachers. Messrs. Scarborough, James.

Ed. 558. Special Problems in Teaching Agriculture. Maximum 9 credits

Current problems in agricultural education. Opportunities for students to study particular problems under the guidance of the staff. Staff.

Ed. 561. Trends in Teaching Vocational Agriculture. 3 or 3 or 3

Designed to develop an understanding of the significant trends in agricultural education, particularly as to their impact on the job of teaching vocational agriculture. (Not offered in 1953-54.)

Ed. 562. Course Building in Vocational Agriculture. 3 or 3 or 3

Determining objectives, student participation, interpretation and use of source materials, selection and organization of subject matter, time, coordination of class work, farm mechanics and FFA. Major emphasis given to high school courses but consideration also given to out-of-school classes.
Mr. Scarbrough.

Ed. 563. Guidance and Individual Instruction. 3 or 3 or 3

Prerequisites: 18 credits in Education, including 6 in Agricultural Education.

Individualized instruction applied to vocational agriculture; agricultural occupations, guidance, and counseling with special reference to pupils in vocational agriculture. Designed for teachers in service. (Not offered in 1953-54.)

Ed. 565. Supervised Farming Programs. 3 or 3 or 3

Planning of comprehensive programs of supervised farming, their relation to the instructional program, supervision, and evaluation. Designed for teachers of vocational agriculture. Mr. Kirkland.

Ed. 568. Adult Education in Agriculture. 3 or 3 or 3

This course is designed to meet the needs of teachers as leaders in adult education. More emphasis is being given to working with adults as part of the community program of vocational agriculture. This course will give the teacher an opportunity to study some of the basic problems and values in working with adult groups. Particular attention will be given to the problem of fitting the educational program for adults into the high school program of vocational agriculture. Messrs. Scarborough, Coggin.

Ed. 616. Problems in Agricultural Teaching. 3 or 3 or 3

Prerequisites: At least 18 credits in Education and permission to register.

Problem solving technique, review of studies in agricultural education, completing research problems. Messrs. Kirkland, Scarborough.

Ed. 617. Philosophy of Agricultural Education. 3 or 3 or 3

Prerequisites: Eighteen credits in Education and permission to register.

Principles and practices involved in the leadership of a teacher of agriculture and in making his work effective in a rural community. Study of leaders in the field. Messrs. Kirkland, Scarborough.

Ed. 618. Agricultural Education Seminar. Maximum 3 credits

Prerequisite: Eighteen credits in Education.

A critical review of current articles and books of interest to students of agricultural education. Staff.

Ed. 621. Research in Agricultural Education. Maximum 9 credits

Prerequisites: Eighteen credits in Education and permission to register.

One or more research problems under the guidance of a member of the staff. Staff.

Ed. 664. Supervision in Agricultural Education. 3 or 3 or 3

Organization, administration, evaluation and possible improvement of present supervisory practice; theory, principles and techniques of effective supervision in agricultural education at different levels.

Messrs. Kirkland, Scarborough.

AGRICULTURAL ENGINEERING

Courses for Undergraduates in Agricultural Engineering

(See pages 191 and 192 for service courses for undergraduates in other departments)

Agr. Engr. 101, 102. Farm Mechanics for Engineers. 3-3-0

Required of Freshmen for all branches of Agricultural Engineering.

Lecture and laboratory practice in woodworking, concrete and masonry work as applied to design and construction of farm buildings; sharpening tools, plumbing, electric wiring; sheet metal and cold metal working, electric and oxy-acetylene welding in the fabrication of farm machinery and conveniences. Messrs. Howell, Blum.

Agr. Engr. 201. Farm Conveniences. 3-0-0

Prerequisites: Agr. Engr. 101, 102.

A study of farm water systems, sewage disposal systems, refrigeration, heating systems, feed handling equipment as regards principle of operation, selection, and installation. Staff.

Agr. Engr. 331. Farm Machinery. 4-0-0

Prerequisites: Agr. Engr. 101, 102. Familiar with and operated at least three makes of farm tractors.

The fundamental principle of operation, care, and adjustment of basic farm machines, both tractor mounted and pull-type. Staff.

Agr. Engr. 332. Farm Engines and Tractors. 0-4-0

Prerequisites: Agr. Engr. 101, 102. Familiar with and operated at least three makes of farm tractors.

Principles of operation of internal combustion engines. A study of clutches, transmissions, differential gears, traction devices and hydraulic systems. Engine overhaul, trouble shooting and tune up. Staff.

Agri. Engr. 341. Soil and Water Conservation I. 0-3-0

General aspects of agricultural hydrology including precipitation, classification of climate, rainfall disposition, and methods of estimating surface runoff. Fundamental soil-water relationships, soil-water-plant relationships, hydraulics of the flow of water in open channels and closed conduits. Mr. Wilson.

Agr. Engr. 351. Farm Structures. 0-3-0

Prerequisites: Agr. Engr. 101, 102.

Space and grouping arrangement, material use, and construction techniques to gain optimum efficiency, use and satisfaction from buildings on the farm. Staff.

Agr. Engr. 352. Curing and Drying of Farm Crops. 0-0-3

Prerequisite: Agr. Engr. 351.

Physical properties of air, fuels, and crop products as applied to the design of systems for removal of moisture from crops. Problems involved in handling and storage in conjunction with drying plants. Staff.

Agr. Engr. 362. Rural Electrification I. 0-3-0

Prerequisites: E.E. 320, 325.

Lecture and laboratory work on rates and costs of serving the farm with electricity; farm wiring and lighting, electric motors, water systems, feed grinding and other commonplace applications of electricity to farming. Mr. Weaver.

Agr. Engr. 401. Senior Seminar. One credit per term

Prerequisite: Senior standing in Agr. Eng.

Students will be assigned special problems, the results of which are to be presented in the class. Maximum of three credits allowed. Staff.

Agr. Engr. 431. Mechanics, Selection and Service of Machinery. 0-0-4

Prerequisites: Agr. Engr. 331, 332. E.M. 311.

A study of mechanics involved in tractor and machinery design and operation, static and dynamic stability of tractors, belt and drawbar efficiency, Nebraska Tractor Tests, capacity, and standardization, operation and management of Dealer Service Shop. Mr. Giles.

Agr. Engr. 441. Soil and Water Conservation II. 3-0-0
Prerequisites: Agr. Engr. 341, C.E. 203.

Factors affecting erosion, methods of controlling erosion, land-use classification, drainage and land clearing, irrigation methods, design requirements for portable irrigation systems, economic aspects of irrigation in the Southeast. Mr. Wilson.

Agr. Engr. 451. Farm Structures Design. 0-0-3
Prerequisite: Agr. Engr. 351.

The design of walls and wall coverings to impair the transfer of heat and moisture. The design of building elements and their connections to withstand the imposed loads. Staff.

Agr. Engr. 462. Rural Electrification II. 0-3-0
Prerequisite: Agr. Engr. 362.

Lecture and laboratory work on materials and design for rural distribution lines; switches and controls; heat and refrigeration; poultry and dairy equipment; special application of electricity to farm processes. Mr. Weaver.

Courses for Advanced Undergraduates and Graduates

Agr. Engr. 501, 502, 503. Special Problems in Agricultural Engineering. 3-3-3
Prerequisites: 10 credits in selected option.

For students who desire advanced work in one of the following subjects: Farm Engines, Tractors, Farm Mach., Buildings, Conveniences, Rural Electrification, Erosion Control and Drainage. Staff.

Agr. Engr. 531. Farm Machinery Design. 0-3-0
Prerequisites: Agr. Engr. 431, M.E. 321, E.M. 321.

Development and design methods and procedures as used in public research agencies and industry. A study of elements and materials, their application, selection and design in farm machines. Design layout and production methods. Staff.

Courses for Graduates Only

Agr. Eng. 601. Research in Agricultural Engineering Credits by arrangement

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

Prerequisites: Graduate standing in Agr. Eng., Any Option.

Research in specialized phases of Agr. Eng.

Agr. Eng. 604. Seminar. Credits by arrangement

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate. Staff.

Prerequisites: Grad. standing in Agr. Eng., Any Option.

Scientific Articles, Progress Reports in Research, and special problems of interest to Agricultural Engineers will be assigned, reviewed and discussed by students and members of the Agr. Eng. Staff.

Agr. Eng. 641. Advanced Drainage, Irrigation and Erosion Control. 0-0-5

Prerequisites: Grad. standing in Agr. Eng., Land Improvement Option.

An advanced study of the more complex problems in Drainage, Irrigation and Erosion Control methods. Mr. Wilson.

Agr. Eng. 651. Advanced Farm Structures. 0-5-0

Prerequisites: Grad. standing in Agr. Eng., Rural Structures Option.

A more advanced study of the problems of Farm Structures than is given in courses Agr. Eng. 322 and Agr. Eng. 423. Staff.

SERVICE COURSES
for
Undergraduates in other Departments

Agr. Engr. 211. Farm Equipment. 3-0 or 3

Prerequisite: Math. 111 or 101.

A study of modern farm machinery and equipment with emphasis on selection, operation, care and adjustment from a farm operator's viewpoint. Staff.

Agr. Engr. 212. Agricultural Drawing. 0-3-0

Drawing-board work covering both freehand sketching and elementary mechanical drawing; working and pictorial drawing, lettering, maps, graphs, tracing, and blueprinting. Staff.

Agr. Engr. 311, 312. Farm Shop. 3-3-0

Lecture and laboratory practice in blueprint reading, sharpening farm tools, making concrete, woodworking, cold-metal working, forging, tempering, soldering, and pipe fitting. Messrs. Howell and Blum.

Agr. Engr. 313. Dairy Engineering. 0-3-0

Required of Dairy Manufacturing Majors.

Prerequisite: Physics 215.

Application and maintenance of power, heating, and refrigeration to equipment and controls used for dairy manufacturing. Staff.

Agr. Engr. 314. Farm Buildings. 0-3-0

Prerequisite: Agr. Engr. 211.

The design, construction, and materials used in modern farm buildings. Staff.

Agr. Engr. 315. Farm Engines. 0-3-0

Prerequisite: Agr. Engr. 211.

Principles of operation of internal combustion engines; engine overhaul and adjustments. Power train of farm tractor. Staff.

Agr. Engr. 321. Terracing, Drainage and Irrigation. 3-0 or 3

Prerequisites: Agron. 201 and Agr. Engr. 211.

Farm surveying and its application to laying out terraces and drainage systems. The construction of terraces and terrace outlets. Mr. Wilson.

Agr. Engr. 413. Teaching Farm Shop Work. 0-0-3

Prerequisites: Agr. Engr. 311 and 312.

The use and care of power tools; shop management and methods of presenting the subject matter. Messrs. Howell, Coggin.

AGRICULTURE

Agr. 101. Introduction to Agriculture 1-0-0

Organization and function of agricultural institutions and agencies; North Carolina agriculture in relation to state and national problems.

Mr. Hilton.

Agr. 301. Rural Adult Education 0-3-0

A study of the major educational and service agencies designed to advance the standards of rural living. The development of agricultural problems in the United States is traced as a background for consideration of the objectives, organization, and procedures of these agencies. This is followed by a consideration of major problems in rural education and principles underlying their solution. Mr. Sloan.

Agr. 401. Principles and Techniques of Extension Education 0-0-3

A study of the background, development, and operation of the Agricultural Extension Service. Consideration is given to major events leading to the establishment of Agricultural Extension, its objectives, organization, and philosophy. Major emphasis is placed on principles underlying Extension education together with techniques of program building and teaching.

Mr. Sloan.

AGRONOMY

Agron. 101. Introduction to Agronomy. 3 or 3-0

Introductory course dealing with fundamental factors in production and management of crops. Mr. Klingman.

Agron. 201. Soils. 5 or 5-0

Prerequisites: Geol. 120 and Chem. 102 or 202.

The properties, origin and classification of soils; fundamental principles of soil science as related to plant growth. Mr. McCaleb.

Agron. 301. Soil Fertility and Fertilizers. 0-4 or 4

Prerequisite: Agronomy 201.

Factors affecting the availability and absorption of plant nutrients in soils. Soil reaction and liming. Sources, manufacture, and utilization of fertilizers. Mr. York.

Agron. 302. Soil Classification. 0-0-4

Prerequisite: Agronomy 201, Geology 120.

The origin, characteristics, classification, and use-suitability of soils of North Carolina and the Southeastern United States; field trips. Mr. Lee.

Agron. 311. Crop Production I: Food and Feed Crops. 4-0-0

Prerequisites: Agron. 101 and Agron. 201.

The content of this course is built around the agriculture of this general region and North Carolina in particular. Crop adaptation and the place of individual crops in different cropping systems are discussed. Special attention is given to production problems with corn, the small grains and the important legume crops grown in this area for their seed. Mr. Jones.

Agron. 401. Soil Management. 0-3-0

Prerequisite. Agron. 301.

Principles of soil management and factors affecting soil productivity. Mr. Nelson.

Agron. 411. Crop Production II: Tobacco and Cotton. 0-4-0

Prerequisites: Agron. 201.

A study of tobacco and of cotton production from the standpoints of botany and growth characteristics, seeding practices, cropping systems, mineral nutrition, field care, varieties, harvesting, processing, elements of quality and factors influencing quality, and uses of the crop. Mr. Colwell.

Agron. 412. Pastures and Forage Crops. 0-0-4

Prerequisites: Agron. 101 and Agron. 201.

A study of the production and preservation of the principal forage crops. Special attention is given to the development and maintenance of pastures. Mr. Chamblee.

Agron. 413. Plant Breeding. 0-3-0

Prerequisite: Gen. 411.

Lectures on methods and principles of plant breeding. Mr. Mann.

Agron. 414. Weeds and Their Control. 0-0-3

Prerequisite: Chem. 203 or equivalent; Agron. 101 and 201.

Principles involved in cultural and chemical weed control. Practice in identification of plants and seeds. Mr. Klingman.

Courses for Advanced Undergraduates and Graduates

Agron. 501. Soil Fertility Evaluation. 4-0-0

Prerequisites: Agron. 301, Chem. 211.

Analysis for available elements in the soil; the use of soil and plant analyses in soil diagnosis. Mr. Fitts.

Agron. 502. Soil Chemistry. 0-4-0

Prerequisites: Agron. 301 and Chem. 212.

Chemical composition and properties of soil, particularly concerning clay mineralogy, chemical processes of weathering, soil solution reactions, chemical properties of clays and ionic exchange in soils. Mr. McAuliffe.

Agron. 503. Soil Physics. 4-0-0

Prerequisites: Agron. 201 and Phys. 201 or 211.

Physical constitution and analyses; structure, water relations, soil air and temperature in relation to plant nutrition. Mr. Lutz.

Agron. 504. Soil Microbiology. 0-0-3
See Botany 551.

Agron. 521, 522, 523. Special Problems. Credits by arrangement
Prerequisite: Admitted only with consent of instructor.

Special problems in various phases of agronomy. Problems may be selected or will be assigned. Emphasis will be placed on review of recent and current research. Staff.

Courses for Graduates Only

Agron. 601. Soil Development.*** 4-0-0
Prerequisite: Graduate standing in soils.

Genesis, morphology, and development of the great soil groups of the world. Mr. McCaleb.

Agron. 602. Advanced Soil Fertility.*** 0-0-3
Prerequisite: Agronomy 301. Graduate standing in soils.

Soil conditions affecting crop growth; the chemistry of soil and plant interrelationships; theoretical and applied aspects of fertilizer usage in relation to plant nutrition. Mr. Nelson.

Agron. 603. Physical and Colloidal Chemistry of Soils.*** 0-0-5
Prerequisite: Graduate standing.

The origin and nature of inorganic and organic soil colloids. The application of principles of physical and colloidal chemistry to soils problems. Current literature in soil chemistry. Mr. Hall.

Agron. 604. Advanced Soil Physics.*** 0-5-0
Prerequisites: Agron. 503, Math. 401, and Phys. 201-203.

An introduction into the usage of theoretical methods in soil physics. Lectures, literature, and discussions centered around problems in potential flow involving soil water, soil gases, and energy. Mr. van Bavel.

Agron. 611. Forage Crop Ecology.*** 0-3-0
Prerequisites: Agron. 412 and Botany 441.

A study of the effect of environmental factors on the growth of forage crops. Attention will be given to methods of research in forage crop ecology. Mr. Chamblee.

Agron. 631. Seminar. One credit per term
Prerequisite: Graduate standing in Agronomy.

Scientific articles, progress reports in research, and special problems of interest to agronomists reviewed and discussed.

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate. Staff.

Agron. 641. Research. Credits by arrangement
Prerequisite: Graduate standing in Agronomy.

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

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*Students are expected to consult the instructor before registration.
**Offered in 1953-54 and in alternate years.
***Offered in 1954-55 and in alternate years.

ANIMAL INDUSTRY

Courses for Undergraduates

A.I. 101. Introductory Dairy Science. 3 or 3-0

The fundamental principles of dairying, dairy processing and the importance of dairy products in the human diet and the state and national economy. Messrs. Haig, Warren.

A.I. 102. Introductory Animal Husbandry. 3 or 3-0

The fundamental principles of meat animal production and meat preservation and the importance of meat products in the human diet and the state and national economy. Mr. Hostetler.

A.I. 301. Types and Market Classes of Livestock. 4-0-0

A study of the types and market grades and classes of beef cattle, swine, sheep, horses and mules together with their adaptabilities and distribution. Mr. Goode.

A.I. 302. Judging and Selection—Dairy Cattle. 0-3-0

Breed characteristics and score-card requirements for the five major breeds of dairy cattle. Relation of form to function. Practice judging. Mr. Murley.

A.I. 303. Judging and Selection—General Livestock. 0-0-3

Fundamental principles involved and the practice of comparative judging of the different types and breeds of meat animals and work stock. Mr. Goode.

A.I. 304. Advanced Judging and Selection—General Livestock. 2-0-0

Prerequisite: A.I. 303.

Practice and reasons in comparative judging of beef cattle, sheep, swine, horses, and mules. Only for students who have shown proficiency in general livestock judging. Extra curricular time will be required of students interested in training for judging teams. Mr. Goode.

A.I. 305. Dairy Breeds and Pedigrees. 3-0-0

A study of the important breeds of dairy cattle and their adaptability to North Carolina; detailed study of dairy pedigrees and breed families; official testing and dairy herd improvement association methods. Mr. Legates.

A.I. 306. Advanced Judging and Selection—Dairy Cattle. 0-0-2

Prerequisite: A.I. 302.

Special emphasis on show-ring requirements for dairy cattle; advanced judging practice with oral reasons. Judging trips to various leading dairy farms will be made. Only students working for place on judging team will take this course. Mr. Murley.

A.I. 312. Animal Nutrition I—Principles of Nutrition. 0-3-0

Prerequisites: Chem. 203 (or equivalent) and Zool. 301.

Metabolism of carbohydrates, lipides, proteins, inorganic elements and vitamins in animal nutrition. Mr. Wise.

A.I. 313. Feeds for Livestock. 0-0-3

Prerequisite: A.I. 312.

Sources, classification, chemical and physical characteristics and nutritive role of various feeds; principles of ration formulation and basis for regulatory measures in the feed industry. Messrs. Barrick, Waugh, Wise.

A.I. 323. Meat and Meat Products. 0-5 or 5

A study of live animal and carcass relationships, dressing percentages, and cut-out values. Slaughtering, cutting, curing, freezing, and handling of meats and meat products for commercial and home use.

Messrs. Blumer, Brown.

A.I. 324. Meat Selection. 2-0-0

A detailed consideration of the factors involved in the selection of carcasses and wholesale cuts of beef, pork and lamb. A thorough study of the identification of retail cuts and their adaptabilities for utilization.

Mr. Brown.

A.I. 343. Dairy Production I. 0-0-4

Principles and practices of dairy cattle selection and management, including feeding, record keeping, selecting breeding and foundation stock.

Mr. Haig.

A.I. 421. Animal Industry Seminar. Max. 3

Review and discussion of special topics and the current literature pertaining to all phases of Animal Production.

Messrs. Colvard, Hostetler, Waugh.

A.I. 441. Pork Production. 4-0-0

A study of types, breed characteristics, and adaptability of swine. Emphasis is given to breeding, housing and marketing swine. Practical work is given in feeding, management and judging. Messrs. Stewart, Barrick.

A.I. 442. Beef Cattle Production. 0-4-0

A study of modern methods of feeding, care, and management of the beef herd. Special attention will be given to feed-lot operations and selection of animals. Mr. Barrick.

A.I. 443. Dairy Production II. 0-0-3

Prerequisite: A.I. 343.

A continuation of A.I. 343. This course will be a more advanced study of practical management of the dairy farm operations including farm sanitation, relationship of disease to management, losses due to sterility, culling of herds, interpretation of cow performance, barn types, etc. Mr. Murley.

A.I. 444. Sheep Production. 0-0-3

A study of the methods used in producing lamb and wool. Principles and practices underlying economical production of sheep, including a study of the breeds and their adaptability. Breeding, feeding, and management of purebred and commercial flocks. Mr. Goode.

A.I. 462. Diseases of Farm Animals. 0-4-0

Prerequisites: Botany 412 and Zool. 301.

Etiology and symptoms of infectious, non-infectious, and parasitic diseases of farm animals. Methods of spread of common infectious diseases with especial emphasis upon economic losses and methods of prevention, control, and eradication of the major diseases of farm animals.

Messrs. Grinnells, Osborne.

Courses for Advanced Undergraduates and Graduates

A.I. 501. Topical Problems in Animal Industry. Max. 9

Staff.

A.I. 502. Animal Breeding. 0-4-0

Prerequisite: Gen. 411.

Physiology of reproduction and the mode of inheritance of important characteristics in farm animals. Origin, history, and adaptability of the breeds of livestock. Special emphasis on the place of selection, artificial insemination, inbreeding, and crossbreeding in an overall program of animal improvement. Mr. Stewart.

A.I. 513. Animal Nutrition II—Nutrient Utilization. 0-0-4

Prerequisite: A.I. 312.

Methods of measuring the metabolism of nutrients and their utilization in maintenance and production. Mr. Wise.

A.I. 522. Physiology of Domestic Animals. 0-4-0

Prerequisite: Zool. 301.

An applied course in advanced physiology of domestic mammals, with special reference to the farm animals. Messrs. Casady, Myers.

A.I. 533. Physiology of Reproduction. 0-0-3

Prerequisite: A.I. 522.

Reproductive anatomy with a detailed study of the physiological processes involved in reproduction, with special reference to farm mammals. Lectures and laboratory exercises including artificial insemination of farm animals. Messrs. Casady, Myers.

A.I. 534. Physiology of Lactation. 0-0-2

Prerequisite: A.I. 522.

The anatomy and physiology of the mammary gland with special reference to factors controlling and influencing the amount and composition of milk. Mr. Casady.

A.I. 562. (See Chem. 562.) Biochemistry of Lipides. 0-3-0

Prerequisites: Chem. 203 or 421, 422, 423.

Distribution, classification, chemistry, and metabolism of the lipides.

Messrs. Nevin and Smith.

Courses for Graduates Only

A.I. 611. Animal Nutrition: Mineral Metabolism. 3-0-0

The role of minerals in the nutrition of animals. Mr. Matrone.

A. I. 621 (See Chem. 621). Enzymes. 4-0-0

Prerequisites: Chem. 423 or 452.

The kinetics, measurements and nature of enzyme action; specific enzymes, coenzyme-enzyme-substrate systems and intermediary metabolism cycles. Mr. Tove.

A.I. 623. (See Chem. 623.) Biological Assay of Vitamins. 0-0-4

Prerequisites: A.I. 312 or Chem. 452; Stat. 412.

Techniques and designs of biological assays for vitamins. Validity tests and methods for computing potency and confidence limits are emphasized. Mr. Sherwood.

*A.I. 626. **Advanced Animal Breeding.** 0-0-3

Prerequisite: Stat. 625.

Review and appraisal of contemporary research in animal breeding. Mr. Legates.

A.I. 631. Research in Animal Industry. Credits by arrangement

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

ARCHITECTURE

Courses for Undergraduates

Arch. 111, 112, 113. Appreciation of Fine Arts, Architecture, Painting, Sculpture. 3-3-3

Elective for students of junior standing in the other five schools of the college.

Principles of art. Study of those qualities which constitute great art in the fields of architecture, painting, sculpture and the minor arts.

Messrs. Baumgarten, Elliott.

Arch. 205, 206. Working Drawings. 0-2-2

Required of second year students in Construction.

The preparation of drawings of details of construction.

Mr. Shumaker.

Arch. 301, 302, 303. Architectural Design I, II, III. 6-6-6

Prerequisites: Design 203, C. E. 229.

Required of all third year students in Architecture.

A study of the architectural design process in its basic methods.

Mr. Fitzgibbon.

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*Offered in alternate years starting with 1953 spring term.

Arch. 401, 402, 403. Architectural Design IV, V, VI. 6-6-6

Prerequisites: Des. 303, C. E. 327.

Required of all fourth year students in Architecture.

Architectural problems on the theory and practice of American community planning and civic design; a seminar on urban development offered by the faculty of the Department of Regional and City Planning and the Institute for Social Science Research of the Consolidated University of North Carolina. The seminar will consider topics on legislation, public health, sanitation, community organization, government, housing, traffic and recreation.

Mr. Matsumoto.

Arch. 501, 502, 503. Architectural Design VII, VIII, IX. 10-10-10

Prerequisites: Arch. 403, C. E. 337.

Required of fifth year students in Architecture.

Comprehensive architectural research and design, integrated with its complementary fields. Mr. Catalano.

BIOLOGY

The Division of Biological Sciences includes the faculties in botany, entomology, genetics, plant pathology, and zoology. Courses offered in these subjects are listed under the appropriate faculty headings. The one course listed below is offered by the combined faculties of the Division.

Biology 101. Fundamentals of Biology. 3 or 3 or 3

A survey of the major principles of the biological sciences. A course designed for students who have not had a college course in the biological sciences and who do not anticipate further study in biology. Not acceptable as a prerequisite for further work in the biological sciences. Mr. Evers.

BOTANY

Introductory Courses in Freshman or Sophomore Curricula

Bot. 101, 102. General Botany. 4-4-0 or 0-4-4

Must be taken in the order listed.

Forestry students will follow a 4-4-0 sequence.

The first term: The structure and physiology of the leaves, stems and roots of higher green plants; the second: a study of sexual reproduction and heredity in the flowering plants, and a survey of the life histories of the major groups of non-green and green plants. **Staff.**

Bot. 203. Systematic Botany. 0-0-3

Prerequisites: Bot. 101, 102.

An introduction to the local flora and the classification of the plants included therein. **Staff.**

Courses for Advanced Undergraduates

Bot. 211, 213. Dendrology. 3-3-0

Must be taken in the order listed unless otherwise permitted by the instructor.

Prerequisites: Bot. 101, 102, 203.

The taxonomy of the principal trees of North America. Mr. Fox.

Bot. 410. Plant Microtechnique. 3-0-0

Prerequisites: Bot. 101, 102, and Chem. 203.

Methods of preparation of plant structures for microscopic examination. Mr. Ball.

Bot. 412. General Bacteriology. 4 or 4 or 4

Prerequisites: Bot. 101, 102, or Zool. 101.

An introduction to the principles of bacteriology; laboratory work on modern cultural methods of handling and studying bacteria. Mr. Peterson.

Bot. 421. Plant Physiology. 5-0 or 5

Prerequisites: Bot. 101, 102, and Chem. 203.

The activities of living plants with special emphasis upon the fundamental principles concerned. Messrs. Anderson, Scofield.

Courses for Advanced Undergraduates and Graduates

Bot. 511. Morphology of Non-Vascular Plants. 0-0-3

Prerequisites: Bot. 101, 102, 203.

Comparative morphology, ontogeny and evolution of the major groups of non-vascular plants. Mr. Ball.

Bot. 512. Morphology of Vascular Plants. 0-3-0

Prerequisites: Bot. 101, 102, 203.

Comparative morphology, ontogeny and evolution of the major groups of vascular plants. Mr. Ball.

Bot. 513. Plant Anatomy. 0-0-3

Prerequisites: Bot. 101, 102, 203.

Anatomy of Gymnosperms and of Angiosperms is emphasized. Comparative growth and structure of meristems. Development and mature structure of cell types, tissues, stem, root, and leaf. Mr. Ball.

Bot. 521. Systematic Botany of Grasses. 3-0-0

Prerequisite: Bot. 203.

Identification and classification of common species. Mr. Wells.

Bot. 523. Systematic Botany of Dicot Families. 0-0-3

Prerequisite: Bot. 203.

Identification, classification and economic significance of important families such as Leguminosae, Rosaceae, and Solanaceae. Mr. Fox.

Bot. 532, 533. Advanced Plant Physiology. 0-3-3

Prerequisites: Bot. 101, 102, 421.

A critical and comprehensive treatment of the various aspects of plant physiology; particular attention given to basic principles and to recent developments. Messrs. Anderson, Scofield.

Bot. 535. Research Methods in Plant Physiology. 0-3-0

Prerequisite: Bot. 421.

A review of certain methods and techniques in use in physiological research; laboratory experience in the use of some of those peculiar to plant physiology. Mr. Scofield.

Bot. 537. Microanalysis of Plant Tissue. 0-3-0

Prerequisites: Bot. 101, 102, 421.

The identification in plant tissues of mineral elements and organic compounds and the physiological significance of these materials.

Mr. Anderson.

Bot. 541. Plant Ecology. 3-0-0

Prerequisites: Bot. 101, 102, 421.

Environmental control of plant distribution with emphasis upon the habitats and vegetation of North Carolina. Mr. Wells.

Bot. 551. Soil Microbiology. 0-0-3

Prerequisites: Bot. 101, 102, 412, 421.

The more important microbiological processes that occur in soils: decomposition of organic materials, ammonification, nitrification, and nitrogen fixation.

Bot. 552. Advanced Bacteriology. 0-3-0

Prerequisites: Bot. 101, 102, 412.

A comprehensive treatment of the fundamentals of bacteriology. Methods used in bacteriological analysis of water.

Bot. 573. Aquatic Botany. 0-0-3

Prerequisites: Bot. 101, 102.

Collection and identification of the important species of aquatic plants of the region and a study of their environmental relations. Emphasis is on the fresh-water algae. Mr. Whitford.

Courses Limited to Graduate Students

Bot. 611, 612, 613. Bacteriology: Special Studies. 3-3-3

Prerequisites: Bot. 412, 552.

Special work on restricted groups of bacteria, such as nitrogen bacteria of the soil, milk organisms, and special groups of bacteria in water.

Bot. 621. Systematic Botany: Special Studies. 3-0-0 or 0-0-3

Prerequisite: Bot. 203.

An advanced survey of restricted groups of plants involving organization and distribution problems. Messrs. Wells, Fox, Godfrey.

Bot. 631, 632, 633. Plant Physiology: Special Studies. 3-3-3

Prerequisites: Bot. 421, 532.

Critical study of some particular problem, involving original investigation together with a survey of pertinent literature.

Messrs. Anderson, Scofield.

Bot. 635. The Mineral Nutrition of Plants. 0-3-0

Prerequisite: Bot. 421.

A treatment of the principles involved in the mineral nutrition of plants with particular emphasis upon the factors concerning nutrient absorption and the functions and interrelations of the mineral elements in the biochemical processes of plant metabolism. Mr. Evans.

Bot. 641. Advanced Plant Ecology. 0-0-3

Prerequisites: Bot. 421, 541.

Practice in the use of the instruments necessary in the study of environmental factors; advanced readings and conferences on plant distribution in relation to these factors. Mr. Wells.

Bot. 642, 643, 644. Plant Ecology: Special Studies. 3-3-3

Prerequisites: Bot. 203, 541.

Minor investigations in vegetation-habitat problems accompanied by advanced reference reading. Mr. Wells.

Bot. 651. Research. Credits by arrangement

Prerequisite: Graduate standing in Botany.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

Bot. 661. Seminar. One credit per term

Prerequisite: Graduate standing.

Attendance at weekly meetings and presentation of one paper during each term registered.

A maximum of three credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

CERAMIC ENGINEERING

Courses for Undergraduates

Cer. E. 202. Ceramic Materials. 0-2-0

Required of Sophomores in Ceramic Engineering.

The origin, occurrence, mining, beneficiation, preparation, properties, and uses of ceramic raw materials. Mr. Kriegel.

Cer. E. 203. Ceramic Processes. 0-0-3

Required of Sophomores in Ceramic Engineering.

The equipment and processes used in the manufacture of ceramic products.

Mr. Moody.

Cer. E. 301. Ceramic Drying. **3-0-0**
Required of Juniors in Ceramic Engineering.
Prerequisites: Phys. 203, Cer. E. 203.
Theory and practice in drying ceramic products; problems.
Mr. Moody.

Cer. E. 302. Ceramic Firing. **0-3-0**
Required of Juniors in Ceramic Engineering.
Prerequisites: Phys. 203, Cer. E. 203.
Theory and practice of firing ceramic products; problems. Mr. Moody.

Cer. E. 307, 308, 309. Ceramic Laboratory I. **2-2-2**
Required of Juniors in Ceramic Engineering.
A laboratory course coordinated and concurrent with Cer. E. 301, 302, 403.
Staff.

Cer. E. 313. Instrumentation in Ceramics. **0-0-2**
Required of Juniors in Ceramic Engineering.
Prerequisite: Cer. E. 302.
The theory, use and maintenance of industrial instruments for controlling ceramic manufacturing processes. Lecture and demonstrations. Mr. Rue.

Cer. E. 330. Ceramic Products. **0-3-0**
Elective for Engineering Students.
Properties, characteristics and industrial applications of ceramic products. Structural clay products, refractories, glass, electrical porcelain, thermal insulators, vitreous enamels, and chemical wares are discussed.
Mr. Kriegel.

Cer. E. 403. Silicates I. **0-0-3**
Required of Juniors in Ceramic Engineering.
Prerequisites: Chem. 332 and Cer. E. 302.
The fundamental principles underlying the composition and production of whitewares, cements, and plasters. Mr. Rue.

Cer. E. 404. Silicates II. **3-0-0**
Required of Seniors in Ceramic Engineering.
Prerequisites: Chem. 332 and Cer. E. 302.
The fundamental principles underlying the composition and production of glazes, glasses and porcelain enamels. Mr. Rue.

Cer. E. 405. Silicates III. **0-3-0**
Required of Seniors in Ceramic Engineering.
Prerequisites: Chem. 332 and Cer. E. 302.
The fundamental principles underlying the composition, production and uses of refractories and abrasives. Mr. Kriegel.

Cer. E. 411, 412. Ceramic Laboratory II. **2-2-0**
Required of Seniors in Ceramic Engineering.
A laboratory course coordinated and concurrent with Cer. E. 404, 405.
Staff.

Cer. E. 413. Senior Thesis. **0-0-3**

Required of Seniors in Ceramic Engineering.

Prerequisite: Cer. E. 412.

Special problem involving independent laboratory investigation in some phase of ceramic engineering. Final report to be submitted in the form of a thesis. **Staff.**

Cer. E. 415, 416, 417. Ceramic Engineering Design. 3-3-3

Required of Seniors in Ceramic Engineering.

Prerequisite: Cer. E. 302.

The design of ceramic equipment and structures. Messrs. Kriegel, Rue.

Courses for Graduates and Advanced Undergraduates

Cer. E. 503. Ceramic Microscopy. 0-0-3

Prerequisite: Geol. 532.

Petrographic techniques for the systematic study of ceramic materials. Interpretation and representation of results. Mr. Rue.

Cer. E. 506. Advanced Studies in Drying. **0-3-0**

An advanced course on the mechanism of drying ceramic solids; heat balance and principles of operation of commercial driers. **Mr. Rue.**

Cer. E. 511. Advanced Studies in Firing. 0-0-3

An advanced course in fuel and heat requirements, thermal behavior, selection and operation of commercial kilns as related to the firing of ceramic products. Mr. Rue.

Cer. E. 517, 518, 519. Advanced Ceramic Experiments. 3-3-3

Prerequisite: Cer. E. 413 or equivalent.

Advanced studies in ceramic laboratory experimentation. **Staff.**

Courses for Graduates Only

Cer. E. 601. Ceramic Chemistry. 3-0-0

Chemical and physical properties of ceramic materials; physiochemical reactions in the manufacture of ceramic products. Mr. Rue.

Cer. E. 613. Ceramic Thermal Mineralogy. 0-0-3

Prerequisite: Cer. E. 601.

Application of the principles of thermo-chemical mineralogy to ceramic problems. Mr. Bell.

Cer. E. 616. Silicate Crystal Structures. 0-3-0

Prerequisite: Phys. 407.

Basic laws of crystal chemistry; classification of the silicates, relation of physical properties to crystal-structure. Mr. Kriegel.

Cer. E. 620. Ceramic Research. 3 to 9

Prerequisite: Graduate standing in ceramic engineering.

An original and independent laboratory investigation in some phase of ceramics will be assigned to meet the desire of the student for specialization A report of such an investigation is required as a graduate thesis. Staff.

Cer. E. 621. Ceramic Engineering Seminar. One credit per term. 1-1-1
Prerequisite: Graduate standing in ceramic engineering.

Reports and discussion of problems in ceramic engineering. A maximum of 3 credits is allowed towards the Master's degree but any number toward the Doctorate. Staff.

Cer. E. 632, 633. Structural Clay Products. 0-3-3
Advanced technology of structural clay materials and their use.
Mr. Kriegel.

Cer. E. 635, 636. Refractories. 3-3-0
Advanced technology of refractory materials and their use.
Mr. Kriegel.

Cer. 639. 640. Whitewares. 3-3-0
Advanced technology of whiteware bodies and glazes. Mr. Rue.

Cer. E. 644, 645. Ceramic Colors and Enamels. 0-3-3
Technological principles underlying the composition and production of ceramic colors and enamel coatings. Mr. Kriegel.

Cer. E. 647, 648. Glass Technology. 3-3-0
Theories concerning the constitution of the vitreous state; multi-component equilibria involved in commercial glass compositions; correlation of the structural, physical and chemical behavior of the glass-making oxides with the properties of glasses. Mr. Kriegel.

Cer. E. 661, 662, 663. Special Studies in Ceramic Engineering. 3-3-3
Open only to candidates for the doctorate.
Special studies of advanced topics in ceramic engineering.
Graduate Staff.

Cer. E. 672. Advanced Ceramic Thermal Mineralogy. 0-3-0
Prerequisite: Cer. E. 613.

Application of the principles of thermo-chemical mineralogy to the more complex systems. Mr. Bell.

CHEMICAL ENGINEERING

Courses for Undergraduates

Ch. E. 205. Chemical Process Principles I. 0-0-3
Required of sophomores in Chemical Engineering.
Prerequisites: Math. 201; Phys. 201; Chem. 215.

An introduction to methods of calculation involving material balances. stoichiometry, the gas laws, vapor pressures, humidity and saturation.
Mr. Schoenborn.

Ch. E. 301. Elements of Chemical Engineering I. 3 or 3-0
Prerequisites: Chem. 202, Phys. 215, Math. 123.

An introduction to principles of chemical engineering including basic calculations involved in industrial processes and equipment. The course is designed for students not majoring in chemical engineering. Staff.

Ch. E. 302. Elements of Chemical Engineering II. 0-3 or 3

Prerequisite: Ch. E. 301.

Underlying theory of the unit operations, such as fluid flow, heat transfer, drying, distillation, filtration, adapted for students not majoring in chemical engineering. Staff.

Ch. E. 311. Chemical Process Principles II. 3-0-0

Prerequisites: Math. 202, Phys. 202, Ch. E. 205.

Required of juniors in Chemical Engineering.

The calculation of heat and weight balances involved in industrial processes. Applications of physical chemistry, thermophysics, thermochemistry, solubility and sorption by the problem method. Mr. Bright.

Ch. E. 312. Chemical Process Principles III. 0-3-0

Prerequisite: Ch. E. 311.

Required of juniors in Chemical Engineering.

A continuation of Ch. E. 311 with more comprehensive problems in fuels and combustion, chemical, metallurgical and petroleum processes. Laboratory work includes technical analysis by standard methods of testing industrial products. Two hours recitation, one laboratory period per week. Mr. Bright.

Ch. E. 313. Unit Operations I. 0-0-3

Prerequisite: Ch. E. 312.

Required of juniors in Chemical Engineering.

Fundamental principles of fluid flow, heat transfer and evaporation with emphasis on design calculations. Mr. Pike.

Ch. E. 315. Chemical Engineering Thermodynamics I. 0-0-3

Prerequisites: Chem. 531; Ch. E. 312.

Required of juniors in Chemical Engineering.

A study of the laws of thermodynamics and their application to chemical engineering problems. Emphasis on the theory, data and approximation methods as applied to physical and chemical systems. Mr. Arnold.

Ch. E. 411, 412. Unit Operations II and III. 3-3-0

Prerequisite: Ch. E. 313.

Required of seniors in Chemical Engineering.

A continuation of Ch. E. 313. Theory and methods of calculation involved in distillation, absorption, drying, size separation, filtration, etc.

Mr. Pike.

Ch. E. 415. Chemical Engineering Thermodynamics II. 3-0-0

Prerequisite: Ch. E. 315.

Required of seniors in Chemical Engineering.

A continuation of Ch. E. 315. Thermodynamic properties, chemical reaction equilibria, vaporization and condensation equilibria, etc.

Mr. Beatty.

Ch. E. 431, 432, 433. Unit Operations Laboratory I, II, III. 3-3-3

Prerequisite: Ch. E. 313; concurrent, corresponding lecture course.

Required of seniors in Chemical Engineering.

Laboratory work on typical apparatus involving the unit operations. Experiments are designed to augment the theory and data of the lecture courses and to develop proficiency in the writing of technical reports.

Staff.

Ch. E. 453. Chemical Processing of Radioactive Materials. 0-0-3

Prerequisite: Phys. 407.

Consideration of the unique procedures required for the bulk manipulation of radioactive chemicals. Particular attention is given to remote operational procedures of precipitation, centrifugation, conveying, solvent extraction and ion exchange. Design of apparatus involving low maintenance and ease of replacement and cleaning by safe methods is considered. Other topics include decontamination procedures and disposal of wastes.

Mr. Pike.

Ch. E. 461, 462, 463. Seminar. 1-1-1

Prerequisite: Senior standing.

Elective for seniors in Chemical Engineering.

Literature survey of selected topics in chemical engineering. Emphasis on oral and written presentation. Staff.

Ch. E. 471, 472, 473. Chemical Engineering Projects. 3-3-3

Prerequisite: Ch. E. 313.

Two terms required of seniors in Chemical Engineering.

Introduction to research through experimental, theoretical and literature studies of chemical engineering problems. Oral and written presentation of reports. Staff.

Courses for Graduates and Advanced Undergraduates

Ch.E. 525. Process Measurement and Control. 3 or 3 or 3

Prerequisite: Ch.E. 313.

Theory and application of methods for measuring, transmitting, recording and controlling such process variables as temperature, pressure, flow rate, liquid level, concentration, humidity, etc. Commercial instruments are utilized for study of a wide variety of industrial control problems. Recorder-controllers are available for simulating industrial control problems of varying difficulty. Mr. Finch.

Ch. E. 527. Process Engineering. 0-0-4

Prerequisite: Ch. E. 412.

Required of seniors in Chemical Engineering.

A study of selected chemical processes with emphasis on the engineering, chemical and economic factors involved. Staff.

Ch. E. 540. Electrochemical Engineering. 3 or 3 or 3
Prerequisite: Physical Chemistry.
Elective for seniors in Chemical Engineering.

The application of electrochemical principles to such topics as electrolysis, electroanalysis, electroplating, metal refining, etc.

Ch. E. 541. Cellulose Industries. 3 or 3 or 3
Prerequisite: Chem. 426.

Methods of manufacture and application of cellulose chemical conversion products. Emphasis placed on recent developments in the fields of synthetic fibers, films, lacquers, and other cellulose compounds.
Mr. Seely.

Ch. E. 542. Technology of Pulp and Paper. 3 or 3 or 3
Prerequisite: Chem. 426 or equivalent.

Fundamentals of pulp and paper manufacture with emphasis on recent advances in the field. Mr. Seely.

Ch. E. 543. Technology of Plastics. 3 or 3 or 3
Prerequisite: Chem. 426 or equivalent.

The properties, methods of manufacture, and applications of synthetic resins. Recent developments in the field are stressed. Mr. Seely.

Ch. E. 544. Fuels and Combustion. 3 or 3 or 3
Prerequisite: Ch. E. 312.

Solid, liquid and gaseous fuels; fundamentals of combustion with application to design and use of industrial equipment. Mr. Bright.

Ch. E. 545. Petroleum Refinery Engineering. 3 or 3 or 3
Prerequisite: Ch. E. 412.

An introduction to the petroleum industry including (1) nature of petroleum and its fractions, octane numbers, viscosity relationships, etc. (2) operations of thermal and catalytic cracking, stabilization, alkylation, isomerization, crude fractionation, etc. (3) problem work covering high pressure phase relationships, and related material. Mr. Pike.

Ch. E. 546. Chemical Reaction Rates. 3 or 3 or 3
Prerequisites: Ch. E. 415 and Chem. 532.

A basic study of the rates of homogeneous reactions, heterogeneous reactions, and catalysis. Staff.

Ch.E. 552. Pulp and Paper Laboratory. 2 or 2 or 2
Corequisite: Ch.E. 541 or Ch.E. 542.

Laboratory work in the technology of pulp and paper. Experimental work includes digestion and treatment of pulp, handsheet preparation and testing, fiber analysis, and chemical and physical tests. Mr. Seely.

Ch. E. 571, 572, 573. Chemical Engineering Projects. 2-2-2
Prerequisite: Permission of instructor.

A laboratory study of some phase of chemical engineering or allied field.
Staff.

Courses for Graduates Only

Ch. E. 611. Heat Transfer I. 0-0-3
Prerequisite: Ch. E. 313.
An advanced course dealing primarily with heat transfer between liquids and solids, optimum operating conditions and design of equipment. (Offered in 1952-53 and alternate years.) Mr. Beatty.

Ch. E. 612. Diffusional Operations. 0-3-0
Prerequisite: Ch. E. 411.
An advanced treatment of mass transfer particularly as applied to absorption, extraction, drying, humidification and dehumidification. (Offered in 1952-53 and alternate years.) Mr. Schoenborn.

Ch. E. 613. Distillation. 0-3-0
Prerequisite: Ch. E. 411.
Vapor-liquid equilibria of non-ideal solutions, continuous distillation of tractive distillation. (Offered in 1953-54 and alternate years.)
Mr. Schoenborn.

Ch. E. 614. Drying of Solids. 0-0-3
Prerequisite: Ch. E. 411.
An advanced course on the mechanism of drying operations with application to design of equipment, such as, cabinet, tunnel, rotary, drum and spray driers. Mr. Pike.

Ch. E. 615, 616. Thermodynamics I and II. 3-3-0
Prerequisite: Ch. E. 415 or equivalent.
Advanced topics in Chemical Engineering thermodynamics including equilibria of physical and chemical systems, high pressure systems, generalized properties of hydrocarbons, etc. Mr. Beatty.

Ch. E. 617. Catalysis of Industrial Reactions. 3 or 3 or 3
Prerequisite: Ch. E. 546.
A study of the mechanism of catalysis with emphasis on practical application to operation and design of industrial processes. Mr. Pike.

Ch. E. 621. Heat Transfer II. 0-0-3
Prerequisite: Permission of instructor.
Conduction, heating and cooling of solids, radiant heat transmission. (Offered in 1953-54 and alternate years.) Mr. Beatty.

Ch. E. 631, 632, 633. Chemical Process Design. 3-3-3
Prerequisite: Ch. E. 411.
Design and selection of process equipment, through solution of comprehensive problems involving unit operations, kinetics, thermodynamics, strength of materials and chemistry. Mr. Pike.

Ch. E. 641, 642, 643. Advanced Chemical Engineering Laboratory. 2-2-2
Prerequisite: Permission of instructor.
Advanced laboratory work in a selected field with emphasis on theory, techniques and performance of equipment. Mr. Pike.

Ch. E. 651, 652, 653. Advanced Topics in Chemical Engineering. 2-2-2
Prerequisite: Graduate standing.

A study of recent developments in chemical engineering theory and practice, such as ion exchange, crystallization, mixing, molecular distillation, hydrogenation, fluorination, etc. Staff.

Ch. E. 656, 657, 658. Special Investigations in Chemical Engineering. 3-3-3
Prerequisite: Graduate standing.

An intensive study of a special field through classroom study, literature surveys, plant visits, conferences and limited laboratory work. Staff.

Ch. E. 661, 662, 663. Chemical Engineering Seminar. 1-1-1
Prerequisite: Graduate standing.

Literature investigations and reports of special topics in chemical engineering and allied fields. Staff.

Ch. E. 680. Chemical Engineering Research. 3 to 9
Prerequisite: Graduate standing.

From 3 to 9 credit hours may be taken any term.

Independent investigation of an advanced chemical engineering problem. A report of such an investigation is required as a graduate thesis. Staff.

CHEMISTRY

Courses for Undergraduates

Chem. 101, 102. General Inorganic Chemistry. 4-4-0 or 0-4-4
The language of Chemistry, fundamental chemical laws and theories, limited study of selected chemical elements, compounds, reactions and processes. Staff.

Chem. 103. Qualitative Analysis. 4-0-0 or 0-0-4
Prerequisite.: Chem. 102.

Fundamental concepts of solutions; theories of ionization, applications of hydrolysis, concentration, mass action, ionization constants, solubility products, oxidation-reduction, amphoterism, coagulations of colloids; special attention to the relative advantages of the more commonly used test reagents and procedures and selected organic and more unusual test reagents and spot test technique; emphasis throughout on the electronic structure of matter and chemical equilibrium. Staff.

Chem. 105. General Chemistry. 4-0-0 or 0-0-4
Prerequisite: Chem. 102.

The colloidal state; preparation, properties and use of selected metals and their compounds; nature and classification of compounds of carbon. Staff.

Chem. 201, 202. General Inorganic Chemistry. 5-5-0 or 0-5-5
Includes content of Chem. 101 and 102, supplemented by study of additional chemical elements and compounds more directly related to interpretation and development in Agriculture and Forestry. Staff.

Chem. 203. Introduction to Organic Chemistry. 5-0-0 or 0-0-5
Prerequisite; Chem. 202.
Survey of hydrocarbons, alcohols, ethers, aldehydes, ketones, acids, esters, fats, sugars, starches, cellulose, proteins, amino acids, vitamins, enzymes, digestion, insecticides, fungicides and chemical weed control. **Staff.**

Chem. 205. Qualitative Analysis. 0-0-5
Prerequisite: Chem. 202.
Includes content of Chem. 103 supplemented by additional laboratory work. **Staff.**

Chem. 211. Quantitative Analysis. 0-0-4
Prerequisite: Chem. 103.
Alkalimetry, acidimetry, oxidimetry, reductimetry.
Messrs. Hentz, Oliver.

Chem. 212. Quantitative Analysis. 0-4-0
Prerequisite: Chem. 103.
Analysis of minerals, limestone and alloys by gravimetric methods.
Messrs. Hentz, Oliver.

Chem. 213. Quantitative Analysis. 0-0-4
Prerequisite: Chem. 212. Co-requisite: Phys. 203 or 215.
Introduction to theory and techniques in the use of optical and electrical methods of analysis. Messrs. Hentz, Oliver.

Chem. 216, 215, 217. Quantitative Analysis. 3-3-3
Prerequisites: Same as Chem. 211, 212, 213.
Same as 211, 212, 213 except less time for laboratory. Required of students in Chemical Engineering. Messrs. Hentz, Oliver.

Chem. 301. Inorganic Chemistry. 0-0-3
Prerequisite: Chem. 103.
Valence theory, covalence, periodic relations of the chemical elements, coordination, oxidation and reduction, properties and reactions of selected inorganic substances. Mr. White.

Chem. 302. Inorganic Syntheses. 0-0-3
Prerequisite: Chem. 212 or 216.
Preparation of pure inorganic compounds, including sources of materials, purification and analysis. Mr. Jordan.

Chem. 331, 332. Elements of Physical Chemistry. 3-3-0
Prerequisites: Chem. 216, Phys. 203, Math. 303.
A survey of certain physicochemical principles leading into a more detailed study of colloidal systems and of phase equilibria in condensed systems of two and three components. Two lectures and one laboratory per week. Required of students in Ceramic Engineering. Mr. Sutton.

Chem. 419. Micro and Trace Chemistry. 0-4-0

Prerequisite: Chem. 213.

Micro-chemistry deals with the techniques of chemical reactions, and the procedures in analysis, when the total samples available are extremely small. Trace chemistry deals with the methods of analysis and techniques in handling, when extremely small amounts of the chemical of interest is intermixed with relatively large amounts of other chemicals or elements. Applications deal with elements resulting from Nuclear Fission. Mr. Hentz.

Chem. 421, 422, 423. Organic Chemistry. 5-5-5

Prerequisite: Chem. 212.

Aliphatic and aromatic compounds; method of preparation and purification of compounds, emphasis on structure and mechanism of organic reaction. Mr. Reid.

Chem. 425, 426. Organic Chemistry. 4-4-0

Prerequisite: Chem. 103.

Required of students in Chemical Engineering.

Lectures and laboratory exercises dealing with preparation, properties, structure, and applications of aliphatic and aromatic substances. Mr. Loeppert.

Chem. 430. Organic Preparations. 0-3-0

Prerequisite: Three years Chemistry including Organic Chemistry.

Experiments selected to acquaint the student with advanced methods and techniques in the preparation of organic substances. Mr. Loeppert.

Chem. 451, 452. Introductory Biochemistry. 4-4-0

Prerequisite: Chem. 203.

The fundamental biochemistry of living matter; lectures, laboratory. Mr. Satterfield.

Courses for Graduates and Advanced Undergraduates

Chem. 527. Advanced Survey of Organic Chemistry. 3-0-0

Prerequisite: Three years Chemistry including Organic Chemistry.

Underlying principles, interpretation of mechanisms, limitations in the use of organic reactions. Mr. Reid.

Chem. 528. Organic Qualitative Analysis. 0-3-0

Prerequisite: Three years Chemistry including Organic Chemistry.

A study of class reactions, functional groups, separation, identification and preparation of derivatives. Mr. Reid.

Chem. 529. Organic Quantitative Analysis. 0-0-3

Prerequisite: Three years Chemistry including Organic Chemistry.

Quantitative determination of carbon, hydrogen, nitrogen, the halogens, and sulfur in organic substances; selected procedures for quantitative determination of functional groups in organic materials. Mr. Loeppert.

Chem. 531, 532, 533. Physical Chemistry. 4-4-4

Prerequisites: Chem. 213 or 217; Phys. 203, Math. 303.

An intensive study of the states of matter, solutions, colloids, homogenous and heterogenous equilibria, reaction kinetics, electrolysis, conductance, oxidation reactions, ionic equilibria. Three lectures and one laboratory per week. Two terms are required of students in Chemical Engineering, three of those majoring in Chemistry. Messrs. Sutton, Jennings.

Chem. 537. Instrumental Methods of Analysis. 0-0-5

Prerequisite: Three years Chemistry including Chem. 532.

Lectures and laboratory exercises on physical methods of chemical analysis, the instruments employed, and the theoretical basis for their operation. Mr. Lott.

Chem. 542. Colloid Chemistry. 0-3-0

Prerequisite: Three years Chemistry.

Adsorption, preparation, purification, properties, constitution, stability and application of sols, gels, emulsions, foams, aerosols. Mr. White.

Chem. 543. Chemical Technology in Radioactivity. 0-0-3

Prerequisites: Chem. 103, Phys. 507, 511, 515, and 520.

Lecture discussion and laboratory practice of the general technology in manipulation of radioactive chemicals on a laboratory scale. Remote control apparatus for performing behind small shields the usual operations of precipitation, filtering, evaporation, mixing, liquid transfer, etc. Particular attention will be given to preparation of thin samples for counting, by evaporation, electroplating, etc. Mr. Hentz.

Chem. 551, 552. General Biological Chemistry. 4-4-0

Prerequisite: Three years Chemistry, including Chem. 423.

The chemical constitution of living matter. Biochemical processes as well as compounds are studied; lectures, laboratory. Messrs. Peterson, Nevin.

Chem. 553. Physiological Chemistry. 0-0-4

Prerequisite: Chem. 552.

Digestion, absorption, metabolism, secretions, and excretions. Laboratory will include analysis of blood and urine. Mr. Satterfield.

Chem. 555. Plant Chemistry. 0-0-4

Prerequisite: Chem. 552.

Composition of plants; properties, nature and classification of plant constituents; changes occurring during growth, ripening, and storage of plants or plant products. Mr. Weybrew.

Chem. 561 (see A.I. 561). Chemistry of Proteins. 0-3-0

Prerequisite: Three years Chemistry including Chem. 423.

Composition, distribution, structure, properties, amino acids, biological value. Mr. Peterson.

Chem. 562 (see A. I. 562). Lipide Chemistry. 3-0-0
Prerequisite: Chem. 552 or equivalent.
Classification, composition, distribution, biosyntheses, and metabolism of lipides. Analysis, syntheses, deterioration, physical properties and chemical reactions of fats and fatty acids. Messrs. Nevin, Smith.

Chem. 563. Chemistry of Carbohydrates. 0-0-3
Prerequisite: Three years Chemistry including Chem. 423.
History, classification, structures and reactions of carbohydrates and related materials. Mr. Robinson.

Chem. 572. Chemistry of Vitamins. 0-3-0
Prerequisite: Three years Chemistry including Chem. 423.
History, nomenclature, properties, distribution, effects of deficiencies, vitamin values. Mr. Satterfield.

Courses for Graduates Only

Chem. 602. Advanced Organic Chemistry. 0-3-0
Prerequisites: Chem. 527, 533.
Theoretical aspects of organic chemistry; relations between chemical constitution and physical properties. Mr. Loeppert.

Chem. 603. Advanced Organic Chemistry. 0-0-3
Alicyclic and heterocyclic compounds, macromolecules, standard type reactions. Messrs. Reid, Loeppert, Robinson.

Chem. 621. (see A.I. 621). Enzymes. 4-0-0
Prerequisite: Chem. 552 and permission of instructor.
The kinetics, measurements, and nature of enzyme action; specific enzymes, coenzyme-enzyme-substrate systems and intermediary metabolism. Mr. Tove.

Chem. 623 (see A.I. 623). Biological Assay of Vitamins. 0-0-4
Prerequisites: Chem. 552, Stat. 512.
Techniques and designs of biological assays of vitamins; validity tests and methods for computing potency and confidence limits are emphasized. Mr. Sherwood.

Chem. 631. Chemical Research. Credits by arrangement
Prerequisite: 54 term credits in Chemistry. Open to all graduates.
Special problems that will furnish material for a thesis.
A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

Chem. 641. Seminar. Credits by arrangement
Required of graduate students specializing in Chemistry.
Preparation and presentation of abstracts of current publications in the field of Chemistry.
A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

Chem. 652, 653. Biochemistry. **0-3-3**
Prerequisite: Chem. 553 or 555.
Special topics in Biochemistry. Messrs. Satterfield, Peterson, Nevin.

Chem. 671, 672, 673. Advanced Physical Chemistry. **3-3-3**
Prerequisite: Three years Chemistry including Chem. 532.

A continuation of Chem. 531, etc. along lines of kinetic theory, elements of statistical mechanics, and advanced thermodynamics offered in 1953-54 and in alternate years. Mr. Sutton.

CIVIL ENGINEERING

Courses for Undergraduates

C. E. 203. Surveying I. **3-0-0**
Prerequisite: Math. 102.

Required of sophomores in Civil Engineering and Construction and juniors in Mechanical Engineering.

Elements of plane surveying, including field practice in taping, transit, level and stadia.

C. E. 204. Surveying II. **0-3-0**
Prerequisite: C. E. 203.
Required of sophomores in Civil Engineering and Construction.
Construction surveys, earthwork computations and topographical maps.

C. E. 205. Surveying III. **0-0-3**
Prerequisite: C. E. 204.
Required of sophomores in Civil Engineering.

Route surveys; simple, compound, spiral and parabolic curves. Chainage equations.

C. E. 208, 209. Surveying and Mapping I. **4-4-0**
Prerequisite: Math. 102.

Required of sophomores in Forestry and juniors in Geological Engineering.

Use, care and adjustment of surveying instruments. Plane and topographical surveys, U. S. Public Land surveys, curves and earthwork computations.

C. E. 229. Analysis of Framed Structures. **0-0-3**
Prerequisites: E. M. 222 (Arch.), E. M. 325 (Construction).
Required of sophomores in Architecture and juniors in Construction.

Analysis of beams and simple framed structures; graphical and analytical methods.

Courses for Advanced Undergraduates

C. E. s300. Surveying and Mapping II. **3 credits**
Prerequisite: C. E. 209.
Required of students in Forestry Management.
Offered only at Hill Forest Summer Camp.

Boundary surveys; complete topographic survey and map of a section of College Experimental Forestry Lands.

C. E. 301. Transportation Engineering I. 3-0-0
Prerequisite: C. E. 205.
Required of juniors in Civil Engineering.
Transportation systems, including railroads, highways, airways, inland and coastal waterways and pipe lines.

C. E. 303. Transportation Engineering II. 0-0-3
Prerequisites: C. E. 301; C. E. 342.
Required of juniors in Civil Engineering.
Highway subgrades, base and surface courses; flexible and rigid pavements. Airport design principles. Construction and maintenance practices. Elements of highway design.

C. E. 323. Materials Testing Laboratory. 0-0-1
Prerequisite: E. M. 222.
Required of sophomores in Architecture.
Testing of materials used in construction.

C. E. 325. Design of Structural Elements. 3-0-0
Prerequisite: C. E. 229.
Required of juniors in Architecture and seniors in Construction.
Design of tension, compression, and flexural elements of steel, timber and concrete; design of simple connections.

C. E. 326. Elementary Indeterminate Structures. 0-3-0
Prerequisite: C. E. 325.
Required of juniors in Architecture.
Slopes and deflections of beams; fixed end moments; analysis of continuous beams; simple bents.

C. E. 327. Elements of Reinforced Concrete Design. 0-0-3
Prerequisite: C. E. 326.
Required of juniors in Architecture.
Principles of plain and reinforced concrete design.

C. E. 328, 329. Construction Design Problems. 0-3-3
Prerequisite: C. E. 325.
Required of seniors in Construction.
Solution of structural problems in erection; forms, shoring, and false work.

C. E. 331. Materials Testing Laboratory. 2-0-0
Co-requisite: E. M. 311 (C. E.); E. M. 325 (Const.).
Required of juniors in Civil Engineering and Construction.
Properties of cementing materials, mortars, concretes, structural ceramic products and building stones; proportioning mortars and concretes.

C. E. 332. Materials Testing Laboratory. 0-2-0
Prerequisite: C. E. 331.
Required of juniors in Civil Engineering, and Construction.
Physical properties and performance characteristics of timber, plywood, glued construction, timber connections, cast iron and plastics.

C. E. 333. Materials Testing Laboratory. 0-0-2

Prerequisite: C. E. 332.

Required of juniors in Civil Engineering.

Properties of structural metals, riveted and welded joints, reinforced concrete; failures of materials, significance of test results, selection of working stresses.

C. E. 335. Steel Design. 2-0-0

Prerequisite: C. E. 327.

Required of seniors in Architecture.

Design of steel structures.

C. E. 336. Timber Design. 0-2-0

Prerequisite: C. E. 335.

Required of seniors in Architecture.

Design of timber structures.

C. E. 337. Independent Designs. 0-0-2

Prerequisite: C. E. 336.

Required of seniors in Architecture.

Complete structural design of the student's project in architectural design; student-teacher relation to approach that of architect-consulting engineer.

C. E. 342. Soil Properties. 0-3-0

Prerequisite: E. M. 311.

Required of juniors in Civil Engineering.

Physical and mechanical properties of soils that govern their use as engineering materials, definitions and fundamental relations; soil testing principles with laboratory demonstrations; classification systems; compaction; and stabilization.

C. E. 343. Foundations. 3-0-0

Co-requisite: C. E. 325.

Required of seniors in Construction and fifth-year students in Architecture.

Identification and classification of soils; subsoil investigation methods; excavating; control of water; types of foundations and conditions favoring their use; legal aspects of foundation engineering.

C. E. 355. Details of Building Construction. 3-0-0

Co-requisite: E. M. 325; prerequisite: E. M. 213.

Required of juniors in Heating and Air Conditioning.

Construction nomenclature, types of structural systems and the structural importance of members. Particular emphasis on placement of building equipment without damage to primary structural elements.

C. E. 357. Construction Estimates. 3-0-0

Prerequisite: Arch. 206 or permission of instructor.

Required of juniors in Construction; technical elective for Civil Engineers.

Analysis of plans and specifications for engineering construction. Preparation of quantity surveys of enginering projects.

C. E. 358. Construction Estimates and Costs. 0-3-0
Prerequisite: C. E. 357.
Required of juniors in Construction.
Analysis of costs of engineering projects. Approximate and detailed estimates of engineering projects.

C. E. 359. Bids and Cost Control. 0-0-3
Prerequisite: C. E. 358.
Required of juniors in Construction.
Preparation of complete cost estimates of enginering projects. Analysis of bidding procedures. Preparation of bids.

C. E. 365. Sanitary Equipment for Buildings. 3-0-0
Prerequisite: E. M. 312.
Required of juniors in Architecture.
Lectures covering private water supplies and sewage disposal facilities, water supply piping and waste and vent piping in building plumbing systems, booster pumps, water heaters, water softeners. Design problem.

C. E. 367. Construction Plant Layout and Equipment. 3-0-0
Prerequisite: C. E. 359.
Required of seniors in Construction.
Analysis of plant layout. Performance analysis of construction equipment.

C. E. 368. Construction Planning and Organization. 0-3-0
Prerequisite: C. E. 367.
Required of seniors in Construction.
Preliminary planning and preparatory work on construction projects. Scheduling of equipment, employment, material and finances.

C. E. 369. Construction Project Analysis. 0-0-3
Prerequisite: C. E. 368.
Required of seniors in Construction.
Complete organization analysis and scheduling of a construction project.

C. E. 380. Introduction to Sanitary Engineering. 3 or 3 or 3
Prerequisite: Chem. 103.
Technical Elective.
Fundamentals of various aspects of sanitary engineering.

C. E. 421. Elements of Structural Design. 3-0-0
Prerequisite: E. M. 422.
Required of seniors in Civil Engineering.
The design of tension, compression and simple flexural members of steel, timber, and concrete.

C. E. 422. Reinforced Concrete. 0-3-0
Prerequisite: C. E. 421.
Co-requisite: C. E. 432.
Required of seniors in Civil Engineering.
Analysis and design of reinforced concrete building elements.

C. E. 423. Structural Design. **0-0-6**
Prerequisite: C. E. 422.
Required of seniors in Civil Engineering.
Specifications; connection details; independent and complete designs of engineering structures.

C. E. 431. Analysis of Simple Structures. **3-0-0**
Prerequisite: E. M. 312.
Required of seniors in Civil Engineering.
Stress analysis of statically determinate beams and framed structures, under fixed loads, influence line treatment for moving loads.

C. E. 432. Indeterminate Structures. **0-3-0**
Prerequisite: E. M. 422; C. E. 431.
Required of seniors in Civil Engineering.
Deflection of beams and trusses, indeterminate stress analysis by moment area, moment distribution and slope deflection.

C. E. 441. Soil Mechanics. **3-0-0**
Prerequisite: C. E. 342.
Required of seniors in Civil Engineering.
Fundamental stress relations, Mohr's rupture hypothesis, shearing strength, earth pressure theories, bearing capacity, stability of slopes, hydrostatics and hydrodynamics of ground water.

C. E. 453. Contracts and Specifications. **0-0-3**
Prerequisite: C. E. 332.
Required of seniors in Construction; technical elective.
Legal aspects of contract documents and specifications for engineering construction; duties and responsibilities of engineers and contractors on construction work ethics and codes of practice; registration.

C. E. 484. Hydraulics. **0-3-0**
Prerequisite: E. M. 430.
Required of seniors in Civil Engineering.
Uniform and non-uniform flow of water in open channels and pressure conduits; theory of design and characteristics of the various types of pumps and hydraulic motors, and flow measuring devices.

C. E. 486. Hydrology and Drainage. **0-3-0**
Co-requisite: C. E. 484.
Required of seniors in Civil Engineering.
The occurrence, distribution and use of surface and ground waters; precipitation, runoff, storage, stream flow records, design of storm drainage and sewerage systems. Statistical analysis of related problems.

C. E. 489. Water Works. **0-0-3**
Prerequisite: E. M. 430.
Required of seniors in Civil Engineering.
Methods of protecting water supplies; estimating water consumption; water supply and distribution systems; fundamentals of water treatment.

C. E. 491. Professional Practice. 1-0-0

Required of seniors in Civil Enginering.

Professional engineering societies and their functions; professional standards; topics of current interest to the Civil Engineer.

Courses for Graduates and Advanced Undergraduates

C. E. 501. Airphoto Interpretation. 3-0-0

Technical elective.

The technique of interpreting engineering data from aerial photographs. A photographic study of soil and drainage conditions as they relate to site selection, location of granular materials, etc.

C. E. 502, 503. Advanced Airphoto Analysis. 0-3-3

Prerequisite: C. E. 501.

Application of the techniques of airphoto interpretation to engineering projects, including engineering soil and drainage maps, location of borrow materials, preliminary reconnaissance for dam location and airport site selection. Student may schedule either or both terms.

C. E. 504. Applied Photogrammetry. 0-3-0

Technical elective.

The construction of planimetric and topographical maps from terrestrial and aerial photographs. The use of stereoscopes, contour finders, sketchmasters, and radial line extension with field control.

C. E. 505, 506. Airport Planning and Design. 3-3-0

Elements of site selection and airport layout; the detailed design and preparation of plans for an airport.

C. E. 511. Traffic Engineering. 3-0-0

Prerequisite: C. E. 303.

Technical elective.

Traffic studies and surveys as they pertain to the solution of basic traffic and highway problems. Fundamental geometric highway design.

C. E. 525, 526, 527. Advanced Structural Design. 3-3-3

Prerequisite: C. E. 432.

Complete structural designs of conventional structures and of unusual projects. Principles of limit design.

C. E. 529. Analysis and Design of Masonry Structures. 0-0-3

Prerequisite: C. E. 432.

Technical elective.

Analysis and design of culverts, dams, foundations, retaining walls.

C. E. 535. Experimental Stress Analysis. 3-0-0

Prerequisite: C. E. 432.

Principles and methods of mechanical analysis; model analysis; applications of resistance strain gages on models and full-scale structures.

C. E. 536, 537. Structural Laboratory. 0-3-3
Prerequisite: C. E. 535.

Test precedures, limitations and methods of interpretation. Experimental projects.

C. E. 541. Fundamentals of Soil Mechanics. 3-0-0

Physical and mechanical properties of soils governing their use as engineering materials, stress relations and applications to a variety of fundamental problems.

C. E. 542, 543. Soil Testing for Engineering Purposes. 0-3-3
Prerequisite: C. E. 441 or C. E. 541.

Qualitative and quantitative soil testing procedures for engineering purposes.

C. E. 545. Foundation Engineering. 0-0-3
Prerequisite: C. E. 441.
Technical elective.

Subsoil investigations; excavations; design of sheeting and bracing systems; control of water; footings, and grillage and pile foundations; caisson and cofferdam methods of construction; legal aspects of foundation engineering.

C. E. 584. Sanitary Microbiology. 0-0-3
Prerequisite: Bot. 412.

Mechanism and dynamics of disinfection and bacteriostasis.

Microbiology of water and sewage and of sewage treatment processes.

C. E. 585. Theory of Water and Sewage Treatment. 3-0 or 3

Study of the physical and chemical principles underlying water and sewage treatment processes; i.e., diffusion of gases into liquids, laws of solubility, equilibrium and ionization constants, anaerobic and aerobic stabilization, sludge conditioning and disposal.

C. E. 586. Analysis of Water and Sewage. 0-3-0
Prerequisite: C. E. 585.

Laboratory experiments in water and sewage analysis. Microscopic examination of water. Interpretation of results and their significance.

C. E. 587. Unit Operations and Processes in Sanitary Engineering. 0-0-3
Prerequisites: E. M. 430, C. E. 586.

A laboratory course in which processes and operations used in sanitary engineering practice are studied: sedimentation, aeration, filtration, adsorption, coagulation, softening, sludge digestion, and activated sludge.

C. E. 589. Fundamentals of Sewage Works. 3-0 or 3
Co-requisite: E. M. 430.

A survey of the fudamentals of sewage disposal and of sewage treatment.

C. E. 594, 595, 596. Civil Engineering Seminar. 1-1-1

Discussions and reports of subjects in civil engineering and allied fields.

C. E. 599. Civil Engineering Projects. 3 to 9

Special projects in some phase of civil engineering.

Courses for Graduates Only

(All graduate courses selected by the student are subject to approval by the student's adviser and the instructor in charge of the course.)

C. E. 607. Pavement Design. 3-0 or 3
Prerequisites: C. E. 303; E. M. 422.
Analysis of current practices in the design of flexible and rigid pavements for highways and airports.

C. E. 613. Highway Engineering Economics. 0-0-3
Prerequisite: C. E. 303.
Analysis of methods used for highway financing, sources of highway funds, highway taxation, and the cost of motor vehicle transportation.

C. E. 614. Advanced Traffic Engineering. 0-3-0
Prerequisite: C. E. 511.
The analysis and correlation of traffic survey data for the elimination of traffic congestion, the reduction of traffic hazards and accidents, the design of urban streets, and traffic signals.

C. E. 616, 617. Geometric Highway Design. 0-3-3
Prerequisite: C. E. 511.
The geometric highway design of intersections at grade, rotary type intersections; grade separation, multibridge, braided and direct connection design.

C. E. 619. Design of Transportation Terminal Facilities. 3-0 or 3
City and regional planning as it pertains to the design and location of transportation terminal facilities.

C. E. 631, 632. Rigid Frame Analysis. 3-3-0
Prerequisite: C. E. 432.
Analysis of simple, complex and multi-story rigid frames; Vierendell trusses; continuous bents and trusses.

C. E. 633. Bridge Analysis. 0-0-3
Prerequisite: C. E. 432.
Continuous trusses, treatment of redundant members, secondary stresses.

C. E. 634. Theory and Design of Arches, Thin Shells and Domes. 0-0-3
Prerequisite: C. E. 631; Co-requisite E. M. 602.
Analysis and design of hinged and rigid arches of both frame and rib construction; thin shells and domes.

C. E. 638. Structural Connections. 0-3-0
Prerequisite: C. E. 631.
Analytical study of stresses in standard connections; load capacities, rigidity of connections; modification of rigid frame analyses to treat frames with semi-rigid connections.

C. E. 639. Structural Specifications. 0-0-3

Prerequisites: C. E. 631, 632.

Evolution of bridge and building codes and specifications. Critical examination of loadings, working stresses and special code requirements; apparent inconsistencies among various specifications.

C. E. 644. Ground Water and Seepage. 0-0-3

Prerequisite: C. E. 441 or C. E. 541.

Principles of hydraulics applied to ground water, theory of flow through idealized masses, the flow net solution, seepage and well problems.

C. E. 645, 646. Advanced Soil Mechanics. 3-3-0

Prerequisite: C. E. 441 or

Co-requisite: C. E. 541.

General principles involved in the theories of soil mechanics, conditions for shear failure, mechanical interaction between solids and water in soils and elasticity problems of soil mechanics.

C. E. 681. Advanced Water Supply. 3-0-0

Prerequisite: C. E. 489.

Consideration and solution of complex problems which arise in the design of water supplies; evaluation of water resources of areas, required sizes for storage and distribution reservoirs, collection of ground waters, design of aqueducts and large transmission lines, design of municipal distribution systems.

C. E. 682. Advanced Water Purification. 0-3-0

Prerequisite: C. E. 585.

The detailed design of water purification units: sedimentation basins, mixing tanks, flocculation basins, filtration beds, chemical feed systems for coagulating and disinfecting agents.

C. E. 683. Advanced Sewerage. 3-0-0

Co-requisite: C. E. 589.

Consideration and solution of complex problems in the design of sanitary sewer systems, storm sewer systems, and combined sewer systems; interceptor design and sea outfall designs.

C. E. 684. Advanced Sewage Treatment. 0-3-0

Prerequisite: C. E. 683.

Design of grit chambers, screens, sedimentation basins, Imhoff tanks, trickling filters, activated sludge plants, sludge digestion tanks. Consideration of requirements of incinerators, sludge gas utilization, sludge disposal beds. Disposal of municipal refuse and garbage.

C. E. 685. Industrial Water Supply and Waste Disposal. 0-0-3

Prerequisite: C. E. 684.

Study of the special requirements of industrial water supplies; i.e., waters for boilers, for paper industries, for food industries, and other selected industries. Study of industrial processes and the wastes they produce, along with methods of treatment and disposal: textile, pulp and paper, food, milk, canneries, etc.

C. E. 689. Stream Sanitation. 0-0-3
Prerequisite: C. E. 684.
A study of the biological, chemical and hydrological factors that affect stream sanitation and stream use.

C. E. 690 Civil Engineering Research. 3 to 9
Independent investigation of an advanced civil engineering problem. A report of such an investigation is required as a graduate thesis.

DAIRY MANUFACTURING (ANIMAL INDUSTRY)

Courses for Undergraduates

D.M. 201. Dairy Technology. 3-0-0
Methods of analysis of milk and milk products and their use in controlling the composition and quality of dairy products. Mr. Warren.

D.M. s304. Market Milk Laboratory. 3 credits
Laboratory practice in the processing of market milk and related products. Staff.

D.M. 313. Judging Dairy Products. 0-0-1
Prerequisite: D.M. 401.
Milk and dairy products judging according to official standards and commercial grades. Mr. Warren.

D.M. s314. Ice Cream Laboratory. 2 credits
Laboratory practice in the processing of ice cream and other frozen desserts. Staff.

D.M. s324. Butter and Cheese Laboratory. 3 credits
Laboratory practice in the processing of butter and cheese. Staff.

D.M. 401. Market Milk. 3-0-0
Market milk and related products from the standpoint of production, processing, distribution and public health inspection. Mr. Roberts.

D.M. 402. Ice Cream Making and Merchandising. 0-5-0
Prerequisite: D.M. 401.
Selection and preparation of ingredients, processing and freezing of ice cream and other frozen desserts. Also, modern methods of merchandising ice cream in the retail store and at the soda fountain. Mr. Warren.

D.M. 403. Cheese Making. 0-0-3
Prerequisite: D.M. 401.
Principles and practices in the manufacture, ripening, and marketing of the various types of cheese. Mr. Warren.

D.M. 411. Dairy Bacteriology I. 4-0-0
Prerequisite: Bot. 412.
Importance of microorganisms in milk and dairy products. Determination of numbers and types of bacteria in dairy products and their relationship to quality. Mr. Speck.

D.M. 423. Butter Making and Dairy By-products. 0-0-3

Prerequisite: D.M. 401.

Principles and practices in the manufacture of butter, condensed milk and other dairy by-products. Mr. Blanton.

Courses for Advanced Undergraduates and Graduates

D. M. 502. Dairy Chemistry 0-3-0

Prerequisite: D. M. 401.

A qualitative study of the physical, colloidal, and chemical properties of milk and its constituents. Mr. Aurand.

D.M. 503. Dairy Plant Management. 0-0-4

Prerequisite: Approval of Instructor.

Business and factory management practices as used in the dairy plant. Mr. Roberts.

D. M. 512. Dairy Bacteriology II 0-3-0

Prerequisite: D. M. 411.

Methods for the recognition of bacteria important in milk and milk products, stimulation (associative growth, chemicals, etc.), and inhibition (bacteriophage, antibiotics, chemicals) of bacteria in milk. Mr. Speck.

D.M. 513. Advanced Dairy Technology. 0-0-4

Prerequisites: D.M. 401 and D.M. 411.

The functions and operations of a dairy control laboratory. A comprehensive study of methods of analysis for dairy products and related non-dairy products; the applications and interpretations of such methods for quality and composition control of dairy products. Mr. Warren.

Courses for Graduates Only

D.M. 601. Topical Problems in Dairy Manufacturing. 1-3 per term

Prerequisite: Graduate standing in Dairy Manufacturing.

A maximum of nine hours is allowed. Staff.

D. M. 603. Advanced Dairy Bacteriology 0-0-4

Prerequisite: Approval of Instructor.

Microbiological fermentations involved in the utilization of milk by-products. Laboratory experiments deal with factors affecting fermentations, chemical and biological measurements of fermentation products.

Mr. Speck.

D.M. 611. Seminar in Dairy Manufacturing. 1 credit per term

Prerequisite: Graduate standing in Dairy Manufacturing.

Scientific articles, progress reports in research, and special problems of interest are reviewed and discussed.

A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

D. M. 613. Advanced Dairy Chemistry. 0-0-4

Prerequisite: Approval of Instructor.

A quantitative study of the physical, colloidal, and chemical properties of milk and its constituents. Mr. Aurand.

D.M. 621. Research in Dairy Manufacturing. Credits by arrangement

Prerequisite: Graduate standing in Dairy Manufacturing.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. **Staff.**

DESIGN

Courses for Undergraduates

Design 101, 102, 103. Design I, II, III. 5-5-5

Required of all first year students in the School of Design.

Introduction to the elements and expression of two and three dimensional design involving a variety of tools, materials and techniques. Orientation of historical and contemporary concepts of art and architecture.

Messrs. Gussow, Howard.

Design 106. Design Principles. 3 or 3 or 3

Required of all first year students in the School of Textiles.

A basic study of the principles of design in theory as they appear in nature, in the arts, and in the products designed by man.

Messrs. Stuart, Bromberg, Baumgarten.

Design 201, 202, 203. Design IV, V, VI. 5-5-5

Prerequisite: Design 103.

Required of all second year students in the School of Design.

Beginning design activity in architecture and related fields with an introduction to research, presentation, and the consideration of constructional, environmental, and social factors. Messrs. Elliott, Caminos, Scott.

Design 211, 212, 213. Descriptive Drawing I, II, III. 2-2-2

Prerequisite: Design 103.

Required of all second year students in the School of Design.

Development of the student's ability to communicate by drawing in various media; the study of the mechanics of descriptive geometry.

Messrs. Stuart, Bromberg, Tavelli.

Design 221. Structures. 2-0-0

Required of all second year students in the School of Design.

A non-mathematical analysis of structural materials and systems.

Mr. Fitzgibbon.

Design 222. Topographics. 0-2-0

Required of all second year students in the School of Design.

The interpretation of topographic maps, preparation of grading plans. A working knowledge of earthwork as an element in design and the ability to evaluate the design potential of a piece of land. Mr. Thurlow.

Design 223. Materials of Construction. 0-0-3

Required of all second year students in the School of Design.

A survey of construction materials and their appropriate uses; the process of manufacture and the essential chemistry of the materials when limiting use, finish or design. A knowledge of customary craft practices is gained by visiting construction projects and shops where materials are prepared.

Mr. Matsumoto.

Design 232, 233. History of Landscape Architecture I, II. 0-3-3

Required of all fourth year students in Architecture and second year students in Landscape Architecture.

Landscape design from the earliest times is considered in its relation to climate and to social, economic, and political systems. From this study is expected an understanding of the characteristic problems of landscape design and of the means which can lead to their successful solution.

Mr. Baumgarten.

Design 311, 312, 313. Descriptive Drawing IV, V, VI. 2-2-2

Prerequisite: Design 213.

Required of all third year students in the School of Design.

Further development of drawing skill with emphasis placed upon variety of technique. Messrs. Stuart, Bromberg, Tavelli.

Design 331, 332, 333. History of Architecture I, II, III. 3-3-3

Prerequisite: Design 103.

Required of third year students in the School of Design.

A critical study of the life and architecture of historic people in relation to social and cultural conditions. Messrs. Baumgarten, Elliott.

Design 411, 412, 413. Descriptive Drawing VII, VIII, IX. 2-2-2

Prerequisite: Design 313.

Required of fourth year students in the School of Design.

Specialized programs as elected in the fields of the painter, sculptor, graphic artist, etc. Messrs. Stuart, Bromberg, Tavelli.

Design 421, 422, 423. Office Procedure I, II, III. 2-2-2

Co-requisites: Arch. 401, 402, 403.

Required of fourth year students in Architecture.

A study of the ethics, organization, and procedures of professional architectural practice; specifications, estimates and building codes.

Mr. Shumaker.

Design 431. History of Architecture IV. 3-0-0

Prerequisite: Design 333.

Required of fourth year students in the School of Design.

A critical study of modern life and architecture in relation to social and cultural conditions. Mr. Baumgarten.

Design 511, 512, 513. Descriptive Drawing X, XI, XII. 2-2-2

Prerequisite: Design 413.

Required of fifth year students in the School of Design.

Supervised study of a selected field in non-architectural design.

Messrs. Stuart, Bromberg, Tavelli.

Design 531, 532, 533. Philosophy of Design I, II, III. 2-2-2

Prerequisite: Arch. 403.

Required of fifth year students in the School of Design.

An introduction to aesthetics and the relationships of philosophic thought to design. Mr. Kamphoefner and Visiting Professors.

DIESEL AND INTERNAL COMBUSTION ENGINES

Dies. 405. Internal Combustion Engines. 3 or 3 or 3

Prerequisite: M.E. 307.

The principles of thermodynamics, mechanics, and kinematics as applied to the design, construction, and operation of the internal combustion engine. Mr. Cochran.

Dies. 507, 508, 509. Internal Combustion Engine Fundamentals. 3-3-3

Prerequisite: M.E. 309.

The fundamentals common to internal combustion engine cycles of operation. The Otto engine: carburetion, fuel distribution, flame propogation, normal and knocking combustion, throttling, pumping, valve and spark timing, and altitude effects the Diesel engine: injection and spray formation, fuel rating, atomization, penetration, diesel knock, combustion, pre-combustion, and scavenging, as applied to reciprocating and rotary engines. Staff.

Dies. 511, 512, 513. Internal Combustion Engine Fuels. 2-2-2

Prerequisite: M.E. 309.

A development of the formation, composition, processing, and treatment of gaseous, liquid, solid, and colloidal fuels, their preparation, combustion, ignition temperatures, inflamability, products of combustion, specifications, CRC tests, and impurity determinations, as they would influence the design, operation, and maintenance of the internal combustion engine. The potentialities of new sources of energy are explored. Mr. Lineberry.

Dies. 521, 522, 523. Engine Balancing. 2-2-2

Co-requisite: Dies. 507, 508, 509.

The mathematical and analytical analysis, and determination of first, second and fourth order forces, couples and torques, influencing bearing pressures and stresses resulting from the reciprocating and rotating masses for single-cylinder, multi-cylinder, in-line, radial, and vee-engines, and the determining and locating of weights for static and dynamic balancing of crankshafts, camshafts, and accessories. Symmetry, cylinder arrangement, and firing orders are studied. Mr. Hoermann.

Dies. 531. Survey of Internal Combustion Engines. 3-0-0

Co-requisite: Dies. 507.

A survey of contemporary American and European internal combustion engines, with emphasis on Diesel engine designs, from the standpoint of dimensions, performance characteristics, and operation as influenced by design details. Staff.

Dies. 532. 533. Engine Design. 0-3-3

Prerequisite: Dies. 531.

Diesel engine parts, sub-assemblies, components, and their bearings and supports are studied from the aspect of strength, stress distribution, materials, method of manufacture, finishes, and treatment. Frames, bases, moving parts, components, and accessories are designed around standards adopted by the industry. Welding, casting, and forging practices of the industry are studied. Mr. Hoermann.

Dies. 536. Aircraft Engines. 0-3-0

Prerequisite: M.E. 309.

Spark-ignition, compression-ignition, and jet engines are studied from the standpoint of design, construction, and operation and as they apply to aircraft. Mr. Hanse.

Dies. 562, 563. Diesel Engine Applications. 0-3-3

Prerequisite: Dies. 531.

Co-requisite: Dies. 508, 509.

A study of the application of the Diesel engine in the fields of transportation, portable power plants, and stationary power plants. Case histories and methods for the selection of Diesel engines to satisfy the power requirements of each field are investigated. Mr. Rice.

Dies. 581, 582, 583. Internal Combustion Engine Experimentation. 2-2-2

Co-requisite: Dies. 507, 508, 509.

The testing of fuels, lubricants, induction systems, and exhaust systems; smoke determinations, instantaneous measurements of combustion pressure, temperature, chemical composition, turbulence, and distribution; performance testing and calibration of fuel pumps and injectors; DEMA tests, and simulated altitude tests. Mr. Hanse.

Dies. 585, 586, 587. Internal Combustion Engine Laboratory. 2-2-2

Co-requisite: Dies. 507.

Laboratory exercises in the fields of spark-ignition and compression-ignition heat engines. Mr. Cochran.

Dies. 601, 602, 603. Internal Combustion Engine Calculations. 3-3-3

Prerequisite: Dies. 509, Math. 401.

An advanced study of the conversion of chemical energy in spark-ignition and compression-ignition engines as influenced by Gibbs phase rule, Gibbs-Dalton law, fugacity of gas mixtures, in the analysis of conventional engine cycles, compound power cycles, closed cycles, and Kreislauf cycle, in the determination of efficiencies and performance as functions of power output and ambient conditions. Kadenacy and inertia charging effects on two-cycle engines are analyzed. Mr. Rice.

Dies. 621, 622, 623. Internal Combustion Engine Vibration Analysis. 3-3-3

Co-requisite: Dies. 507, 508, 509.

Prerequisite: Math. 401.

Equivalent elastic systems and configurations for internal combustion engines and their rotating and reciprocating masses, elasticities of crankshafts, drive shafts, and couplings, methods of calculating natural frequencies, elastic modes, exciting torques, and stresses, energy absorbing and dynamic dampers, vibration isolators, vibrations in engine parts, turbine blades, valve springs, intake and exhaust manifolds, injection pipes, and parallel operation are studied mathematically and graphically.

Mr. Hoermann.

Dies. 661, 662, 663. Internal Combustion Engine Power Plant Design. 3-3-3

Prerequisite: Dies. 531.

The power requirements for typical industrial, municipal, institutional and regional power plants are analyzed, survey reports and specifications compiled, design and detail layouts executed, and installation schedules developed with the internal combustion engine as the source of power.

Mr. Rice.

Dies. 671, 672, 673. Internal Combustion Engine Auxiliaries. 3-3-3

Prerequisite: Dies. 531.

Advanced study, mathematical analysis and design calculations of: vane, displacement, and centrifugal blowers, superchargers and pressurechargers, mechanically and turbine driven; fuel pumps, metering devices, injectors and injection systems; engine governors, torque and speed control mechanisms. Staff.

Dies. 691, 692, 693. Seminar. 1-1-1

A convocation of faculty and students engaged in advanced study.

Staff.

Dies. 695. Internal Combustion Engine Research. 3 to 9

Research in the internal combustion engine field. Staff.

ECONOMICS

Courses

Econ. 301, 302, 303. General Economics. 3-3-3

Not open to students with fewer than 45 credits.

Required of sophomores in Textiles, Industrial and Rural Recreation, Ind. Education, Forestry-Lumber Products mfg. and Merchandising, juniors in Ind. Arts Education, Tex. Chem., Math. Educ., and Science Educ. Econ. 301, 302 required of sophomores in General Agriculture, Dairy Mfg., Agr. Engr., Forest Mgt., Wood Tech., Wild Life Cons. and Mgt.; juniors or seniors in specialized Agric.; juniors in Agr. Educ.; seniors in Agric. and Biol. Chem. Elective for others.

A study of economic institutions and general principles governing production and distribution of wealth under the existing economic organization.

Staff.

Econ. 305. Business Organization. 0-3-0

Prerequisites: Econ. 301, 302, 303 or equivalent.

Forms of business enterprises; single enterprises, partnerships, joint-stock companies and corporations; principles of business management.

Mr. Lyons.

Econ. 312. Accounting for Engineers. 0-0-3 or 0-3-0

Required of juniors: Ind. Educ. Elective for others.

A survey of accounting principles; financial statements, their construction, use, and interpretation. Mr. Shulenberger.

Econ. 344, 345. Economic Principles. 3-3-0 or 3-0-3 or 0-3-3

Prerequisites: History 241, 242, Sociology 243, or acceptable substitutes.

Required of junior engineering students.

A general descriptive and analytical treatment of our fundamental economic policies and practices. Staff.

Econ. 346. Modern Economic Problems. 3 or 3 or 3

Prerequisite: Econ. 344, 345.

A continuation course dealing with more thorough analysis of economic issues from various viewpoints such as management-labor problems, government expenditures, transportation, public utilities, monopolies, economic systems, etc. Staff.

Econ. 354, 355. Consumer Economics. 3-3-0 or 3-0-3 or 0-3-3

A study of Economics from the consumer viewpoint through established economic principles treated objectively. Staff.

Econ. 401, 402, 403. Principles of Accounting. 3-3-3

Required of sophomores in Forestry; Wood Tech., Lumber Prod. Mdse., juniors in Ag. Econ., Ind. E., Tex. (alternate with Psych.), Furn. Mfg.-Mgt. Econ. 401, 402 required of sophomores Heat. and Air Cond., juniors in Const.

Fundamental principles of theory and practice; interpretation of the structure, form, and use of business statements.

Messrs. Shulenberger, Fails.

Econ. 407. Business Law. 3 or 3 or 3

Prerequisite: Junior standing.

Required of juniors Forestry; Lumber Prod. Mdse., Heating and Air Cond., Ind. Arts Educ., Ind. Engr.; Furn. Mfg. and Mgt., seniors in Land. Arch., Forestry; Wood Tech., Arch. 5th year.

Sources of law; fields of law; contracts, agency sales; negotiable documents; the law as it controls business transactions.

Messrs. Lyons, Manning.

Econ. 408. Advanced Business Law. 0-0-3

Prerequisite: Econ. 407.

A continuation of Economics 407, including bailments, suretyship, real property; corporations; recent developments in State and Federal Law.

Mr. Lyons.

Econ. 409. Construction Accounting. 0-0-3

Prerequisites: Econ. 401, 402.

Required of juniors in construction.

An introduction to the accounting problems peculiar to a construction organization. An analysis of the problems of estimating and allocating the costs of materials, labor and overhead to individual jobs.

Econ. 410. Manufacturing Accounting. 0-0-3

Prerequisites: Econ. 401, 402.

Required of juniors in Industrial Engineering.

An introduction to the accounting problems peculiar to a manufacturing organization. An analysis of the problems of estimating and allocating the costs of materials, labor and overhead to the various units of product.

Econ. 411, 412, 413. Marketing Methods and Sales Management. 3-3-3

Prerequisites: Econ. 301, 302, 303; Econ. 344, 345, 346.

Required of seniors in Tex. Mgt.; juniors in Forestry, Lumber Prod. Mdse.; Econ. 411, 412 required of juniors in Farm Mkt., and Farm Fin.; Seniors in Furn. Mfg. and Mgt.

Marketing functions, agencies, systems; retailing; marketing analysis; problems in marketing; elements of sales management. Mr. Moen.

Econ. 415. Advertising. 0-0-3

Prerequisites: Econ. 301, 302, 303.

Principles of advertising. Mr. Moen.

Econ. 418. Money and Credit. 3-0-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

The functions, history, and development of money and credit; contemporary policies and relation to prices; interrelations of money and credit in banks and financial institutions. Mr. Moen.

Econ. 419. Modern Banking. 0-3-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Origin and development of banking in the United States; functions and operations of the modern bank; banking laws; Federal Reserve System. Mr. Moen.

Econ. 420. Corporation Finance. 0-0-3

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Raising and spending of funds and standards of control. Mr. Moen.

Econ. 425, 426. Industrial Management. 3-3-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Required of juniors in Textiles and Textile Chemistry, elective for all others. Required of seniors in Ind. and Rural Recreation.

Principles and techniques of modern scientific management; relationship of finance, marketing, industrial relations, accounting, and statistics to production; techniques regarding specific problems; analysis of economic, political, and social influences on production. Messrs. Wood, Bartley.

Econ. 431. Labor Problems. 3-0-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Required of seniors in Constr. and Ind. Engr.

An economic approach to labor problems, including such topics as insecurity, wages, hours, working conditions, substandard workers, legislation aimed at correcting existing evils. Mr. Wood.

Econ. 432. Industrial Relations. 0-3-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Required of seniors, Constr., Ind. Engr., Ind. E. Furn. Opt., Ind. Engr. Furn. Mfg. and Mgt.

Collective bargaining. Analysis of basis labor law and its interpretation by courts and government agencies. Examination of specific terms of labor contracts and their implications for labor and management. Examination of labor objectives and tactics and management objectives and tactics.

Mr. Wood

Econ. 433. Personnel Management. 3 or 3 or 3

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Required of juniors in Textiles and Textile Chemistry and Dyeing, seniors in Ind. Engr., Ind. E. Furn. Opt., Ind. Engr. Furn. Mfg. and Mgt., Heat. and Air Cond.

Emphasis on the human problems of industry. A review of the scientific techniques and results of research regarding the problems of employment; training, promotion, transfer; health and safety; service and welfare; and Joint relations. Messrs. Wood, Bartley.

Econ. 435. Time Study. 0-3-0

Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.

Analysis of shop operation into elements, and the determination of the time for each element; emphasis on factors affecting job specification, and wage-rate setting. Mr. Wood.

Econ. 468. Survey of Statistical Methods. 3 or 3-0

Prerequisites: Econ. 301, 302, 303.

Methods of describing quantitative data; collection and methods of analysis of statistical materials; charts and graphs for presenting numerical facts. Staff.

Econ. 469. Statistical Technique. 0-3-0

Prerequisite: Econ. 468.

The problem of estimation, correlation; simple linear and nonlinear forms; normal curve and probable error; methods of sampling. Staff.

Econ. 501. Advanced Economic Theory. 3-3-0

Prerequisite: Eighteen (18) term credits in Economics.

Recent and current economic theory; principal schools of economists; theory of prices under the system of free enterprise. Staff.

Econ. 502. History of Economic Doctrines. 0-0-3

Prerequisite: Econ. 501.

History of economic doctrines from the Mercantilists to the recent Economists. Staff.

Econ. 503. Advanced Accounting. 3-0-0

Prerequisites: Econ. 401, 402, 403 and Econ. 301, 302.

Problems of asset valuation, such as depreciation, replacements, amortization, etc., found in all types of business organizations. Mr. Shulenberger.

Econ. 504, 505. Principles of Cost Accounting. 0-3-3
Prerequisites: Econ. 401, 402, 403 and Econ. 301, 302.
Required of seniors in Textile Management.
Cost finding, material costs, labor costs, overhead costs, etc.
Mr. Shulenberger.

Econ. 509. Introduction to Linear Programming. 0-0-3
Prerequisites: Econ. 302 or Econ. 345; Math. 303 or Math. 313; and consent of instructor.
An introduction to recent developments in the organization of interdependent activities. The exposition of elementary portions of the mathematical theory will be followed by discussion of applications in economics, agriculture, and industry. Mr. Harrell.

Econ. 510. Public Finance and Taxation. 0-3-0
Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.
Classes of income and expenditure; incidence of different classes of taxes.
Mr. Moen.

Econ. 514. International Economic Relations. 0-0-3
Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.
Backgrounds and some newer developments in international economics, with special emphasis on the position of the United States in world trade.
Staff.

Econ. 515. Investment Problems and Policies. 0-3-0
Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.
Different types of investments and methods of judging them. Managing personal finances. Mr. Moen.

Econ. 518. Principles of Insurance. 0-0-3
Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.
Elective.
Risk as an element of all agricultural and industrial activity; discussion of such risks as can be covered by insurance with the appropriate form of insurance, e.g., employer's liability, workmen's compensation, fire, life, and other forms. Mr. Shulenberger.

Econ. 521. Office Management. 3 or 3 or 3
Prerequisites: Open to seniors and graduate students only.
The application of scientific management principles to office problems including: office planning and layout, equipment appliances, filing, correspondence supervision, selection and training of office employers, promotions and wage increases, office costs and budgets. Mr. Wood.

Econ. 531, 532, 533. Management of Industrial Relations. 3-3-3
Prerequisites: Open to seniors and graduate students only.
A seminar course;
An examination of the entire field of industrial relations. Economic, social, labor and management's points of view. The relation to and effects of industrial relations on management problems and policies.
Mr. Wood.

Econ. 541, 542, 543. Economics of Transportation. 3-3-3
Prerequisites: Econ. 301, 302, 303 or Econ. 344, 345, 346.
The economic aspects of transportation facilities provided by the railroads, highways, and air- and water-transportation agencies; principles and problems of rate making, operation, management, valuation, coördination and government regulation. Staff.

EDUCATION

	Page		Page
General Courses	235	Mathematics and Science Education	292
Agricultural Education	186	Occupational Information and Guidance	311
Industrial Arts and Industrial Education	270	Psychology	324
Industrial and Rural Recreation	280		

GENERAL COURSES

Ed. 203. An Introduction to Teaching. 0-0-3

A course designed to aid prospective teachers in becoming familiar with the scope and purposes of secondary education, the qualifications and responsibilities of teachers, the relation of the school to the community, and current problems of secondary school teachers. Staff.

Ed. 308. Visual Aids. 3 or 3 or 3

Methods and technique of visual instruction; lettering; statistical illustrating; chart, graph, and poster-making; photography; projector operation, care, and use. Mr. Armstrong.

Ed. 344. Secondary Education. 3 or 3 or 3

A study of the problems attending the development of secondary education; lateral and vertical extension of its services; development of curricula, courses of study, objectives, and appraisal; activity areas of teacher and pupil. Mr. Tolbert.

Courses for Graduates and Advanced Undergraduates

Ed. 501. Education of Exceptional Children. 3-0-0

Advanced Undergraduates or Graduates. Prerequisite: six hours in education or psychology.

Discussion of principles and techniques of teaching the exceptional child with major emphasis on the mentally handicapped and slow learner. Practice will be given in curriculum construction for groups of children, individual techniques for dealing with retarded children in the average classroom. Opportunity for individual work with an exceptional child will be provided.
Mr. Corter.

Ed. 502. Analysis of Reading Abilities. 3-0-0

Prerequisites: six hours in education or psychology.

A study of tests and techniques in determining specific abilities; a study of reading retardation and factors underlying reading difficulties.
Mr. Rust.

Ed. 503. Improvement of Reading Abilities I. 0-3-0

Prerequisites: six hours in education or psychology.

A study of methods used in developing specific reading skills or in overcoming certain reading difficulties; a study of the problem of providing for individual differences in reading ability and an appreciation of the need for differentiated instruction in the classroom. Mr. Rust.

Ed. 504. Improvement of Reading Abilities II. 0-0-3

Prerequisites: six hours in education or psychology.

A study of methods used in developing pupil vocabularies and word analysis skills; a study of how to control vocabulary burden of reading material. Mr. Rust.

Ed. 552. Industrial Arts in the Elementary School. 3 or 3 or 3

Prerequisites: 12 credits in education and consent of instructor.

This course is organized to help industrial arts majors and elementary teachers and principals to gain an understanding of the materials, processes and products of industry; to show how these may be used to vitalize the elementary school program. Staff.

Ed. 615. Introduction to Educational Research. 3 or 3 or 3

An introductory course for those students preparing for an advanced degree. It is designed to develop an understanding of the meaning and development of research and research needs in the field of education. It includes a study of the basic methods and procedures commonly used in selecting problems, and in collecting, analyzing, and interpreting data. Mr. Tolbert.

ELECTRICAL ENGINEERING

Courses for Undergraduates

E. E. 201, 202, 203. Electrical Engineering Fundamentals. 3-3-3

Prerequisite: Math. 103. Physics 201, 202 and Math. 201, 202 are to be taken concurrently with E. E. 201, 202, and are prerequisites for E. E. 203.

Required of sophomores in E. E.

Fundamental laws of electric circuits, magnetic circuits, electric fields, and magnetic fields; problem drill. Staff.

E. E. 215, 217. Electrical Measurements Laboratory. 1-0-1

Co-requisite for E. E. 215 is E. E. 201; for E. E. 217 it is E. E. 203.

Required of Sophomores in E. E.

A laboratory course coordinated with E. E. 201, 202 and 203, dealing with the techniques and instruments involved in the measurements of electrical quantities. Staff.

E. E. 301, 302, 303. Alternating Current Circuits and Lines. 3-3-3

Prerequisites: E. E. 203, Math. 202.

Required of Juniors in E. E.

The theory of periodic currents, alternating-current circuits and systems. Elementary network theory. Introduction to transformer theory. Polyphase systems. Non-sinusoidal e.m.f.'s and currents. The theory of electrical transmission lines. Staff.

E. E. 305. Direct Current Machinery. 3-0-0

Prerequisite: E. E. 203.

Required of Juniors in E. E.

Principles, performance, and characteristics of direct-current machinery and auxiliary equipment. Staff.

E. E. 311, 312. Dynamo Laboratory. **1-1-0**

Prerequisite: E. E. 217.

Required of Juniors in E. E. Concurrent with E. E. 301-2 and E. E. 305.

A coordinated laboratory course supplementing the classroom work in E. E. 301, 302, 303, and 305. Experimental studies and tests on D. C. and A. C. circuits and on D.C. motors and generators. Staff.

E. E. 320. Elements of Electrical Engineering I. 3 or 3 or 3

Prerequisites: Math. 202, Phys. 203.

Required of senior students in Aero. E., Cer. E., Chem. E., Geol. E., I.E., and M.E., and of junior students in C.E.

Basic concepts—electrical power, generation of electrical power, circuit constants, single phase A. C. circuits, single phase transformers, and polyphase circuits. Staff.

E. E. 321. Elements of Electrical Engineering II. 0-3 or 3

Prerequisite: E.E. 320.

Required of senior students in Aero. E., Cer. E., Chem. E., Geol. E., I.E., and M.E., and of junior students in C.E.

Electrical machines: machine windings, polyphase induction motors, single phase motors, D. C. machines, vacuum tubes and their characteristics.

Staff.

E. E. 322. Elements of Electrical Engineering III. 0-0-3

Prerequisite: E. E. 321.

Required of senior students in M.E.

Transformer connections, electrical machines (review), synchronous machines. Electronics: amplifiers and oscillators, gas-filled tubes, power supplies and control circuits. Staff.

E. E. 325, 326, 327. Electrical Engineering Laboratory. **1-1-0 or 1-1-1**

A laboratory course coordinated and concurrent with E. E. 320, 321, 322.

Staff.

E. E. 337. Illumination. 3-0-0 or 0-0-3

Prerequisites: E. E. 301, E. E. 217.

A classroom and laboratory study of the principles involved in the production and utilization of light from artificial sources. Photometric methods, units, and standards. Incandescent, gaseous-conduction, and fluorescent sources. Design of indoor and outdoor lighting installations. Mr. Winkler.

E. E. 340, 341, 342. Industrial Electricity. **3-3-3**

Prerequisites: Physics 211, 212, 213.

Required of juniors in the Construction and Heating & Air Conditioning curricula.

A study of basic electric circuits and machinery with emphasis on single phase and three-phase power and energy relations; the performance, maintenance, and applications of motors and transformers; motor control; rules for wiring as specified by the National Electric Code. Staff.

E. E. 343a. Electrical Equipment of Buildings. 0-3-0

Prerequisite: Math. 211.

Required of seniors in Architecture.

A study of the wiring of buildings for light and power, and of the design of lighting systems, and of the National Electric Code. Mr. Winkler.

E. E. 343b. Electrical Equipment of Buildings. 0-0-3

Prerequisites: Physics 211, 212, 213.

Required of juniors in Furniture Manufacturing and Management.

A study of circuits used in wiring buildings and factories for power. Wiring diagrams for motors and control. Regulations governing wiring installations. Mr. Winkler.

E. E. 345, 346, 347. Industrial Electricity Laboratory. 1-1-1

Concurrent with E. E. 340, 341, 342.

Experiments with circuits, motors and controls; wiring diagrams for light and power. Staff.

Courses for Advanced Undergraduates

E. E. 401, 402. Alternating Current Machinery. 3-3-0

Prerequisite. E. E. 302, E. E. 305.

Required of seniors in E. E.

Principles and characteristics of single and polyphase transformers, induction motors, and synchronous machines. Messrs. Eckels, Fouraker.

E. E. 411, 412, 413. Advanced Dynamo Laboratory. 1-1-1

Required of seniors in E. E. Concurrent with E. E. 401, 402.

Experimental studies and tests on transformers, alternating current motors and generators, and transmission lines. Staff.

E. E. 415a, 416a. Fundamentals of Electronics. 0-3-3

Prerequisites: For. E. E. 415a, E. E. 301, and Math. 303; for E. E. 416a, E. E. 302.

Required of juniors in E. E.

A study of the fundamentals of electrical conduction in vacua and gases. Operating characteristics of vacuum and gaseous tubes, mercury arc rectifiers, photoelectric cells, cathode-ray oscilloscopes, etc. Introduction to vacuum tube circuit theory. Messrs. Brennecke, Hoadley, Stevenson.

E. E. 415b, 416b. Electronic Laboratory I and II. 0-1-1

Co-requisites: E. E. 415a, E. E. 416a.

Required of juniors in E. E.

A laboratory course designed to illustrate the principles studied in E. E. 415a and 416a. Staff.

E. E. 424. Central Stations. 0-0-3

Prerequisites: M. E. 309, E. E. 402.

Optional, for E. E. seniors, with E. E. 583.

Layout and operation of steam and hydroelectric stations. Prime movers and auxiliary equipment; bus systems, switchgear, etc. Management, plant economics, rate making, federal regulations. Mr. Fouraker.

E. E. 445, 446, 447. Electrical Engineering Pro-Seminar. **1-1-1**

Prerequisite: Senior Standing.

Required of seniors in E. E.

Weekly meetings for the delivery and discussion of student papers on topics of current interest in Electrical Engineering. Mr. Brennecke.

Courses for Graduates and Advanced Undergraduates

E. E. 501. Electric Transients. 3-0-0

Prerequisites: E. E. 302, Math. 401.

Required of seniors in E. E.

An introductory study of the transient behavior of electrical circuits; switching transients and pulsed linear networks. Operational methods of analysis are emphasized. Messrs. Brennecke, Gauster.

E. E. 503. Electromagnetic Fields. 0-0-3

Prerequisites: E. E. 303, Math. 401.

Required of seniors in E. E.

A re-survey of the classical theory of electricity and magnetism and its application to the problems of electrical engineering. The viewpoint of vector analysis is used throughout. Static fields; potential and force fields; field calculations and plotting; Maxwell's Equations; introduction to guided waves and radiant fields. Messrs. Brennecke, Gauster.

E. E. 510. High Voltage Laboratory 2 or 2 or 2

Prerequisite: E. E. 303 or Physics 401.

A laboratory course in the techniques of producing and handling high voltages. Corona, surface discharge, breakdown, and other transient phenomena are studied. Typical high voltage tests are performed on dielectrics. One lecture and one laboratory session each week. Mr. Gauster.

E. E. 527. Electric Transmission. 3-0-0

Prerequisites: E. E. 303, Math. 303.

Optional, for E. E. seniors, with E. E. 581.

Long distance transmission of power. Determination of line constants by the method of geometric mean distances. The general circuit constants and equations. Regulation, loss, and efficiency prediction by circle diagrams. Mr. Stevenson.

E. E. 528. Power Network Calculations. 0-3-0

Prerequisite: E. E. 527.

Optional, for E. E. seniors, with E. E. 582.

The method of symmetrical components applied to fault calculation in power system networks. Equivalent impedances of short and long lines with and without terminal grounding and for ground wires, transformer banks, synchronous machines, asynchronous machines. Syntheses of complete systems, with calculations of fault currents for different types of faults. Mr. Stevenson.

E. E. 529. Electric Power Applications. 0-0-3

Prerequisite: E. E. 402.

Design and selection of electrical equipment for various industrial applications: mine hoists, electric traction, steel mills, etc. Speed control.

Mr. Stevenson.

E. E. 571. Industrial Electronics and Control. 3-0-0 or 0-0-3

Prerequisites: E. E. 416a, 416b; Co-requisite: E. E. 401.

A study, with laboratory tests, of the application of electronic devices to industrial processes and equipment outside the field of Communication. Speed and voltage control; timing devices; electronic heating; air purification; production and quality control; photoelectric devices. Mr. Glenn.

E. E. 573. Fundamentals of Servomechanisms. 3-0-0 or 0-0-3

Prerequisites: Math. 401, E. E. 302 or 321.

Dynamics and synthesis of closed-loop control systems using transient and sinusoidal analyses. Applications to practical electrical, mechanical, and chemical systems. Mr. Eckels.

E. E. 581, 582, 583. Electric Communication. 3-3-3

Prerequisites: E. E. 303, 416a, 416b.

Optional, for E. E. seniors, with E. E. 527, 528, and 424.

A classroom and laboratory study of the circuits and equipment involved in radio and wire communication: amplifiers, oscillators, modulation and detection, etc. Mr. Carson.

Courses for Graduates Only

E. E. 605, 606, 607. Electrical Engineering Seminar. 1-1-1

Prerequisite: Graduate standing in E. E.

A series of papers and conferences participated in by the instructional staff, invited guests, and students who are candidates for advanced degrees. Mr. Hoadley.

E. E. 611, 612, 613. Communication Networks. 3-3-3

Prerequisites: E. E. 303, E. E. 501.

Steady state and transient performance of the generalized network. Analysis and synthesis of two- and four-terminal reactive networks. Wave filters and phase equalizers. Networks containing resistances and reactances. Corrective and broad-band networks. Mr. Hoadley.

E. E. 614. Feedback Systems. 0-0-3

Prerequisite: E. E. 612. E. E. 613 is to be taken concurrently.

A study of feedback systems, such as feedback amplifiers, regulators, and servomechanisms. The study includes both the analysis and the synthesis of such systems, in terms of transient and steady-state response, using mathematical methods based on the theory of the complex variable.

Mr. Hoadley.

E. E. 615. Electromagnetic Waves. 3-0-0
Prerequisite: E. E. 503.

Maxwell's Equations applied to a study of the propagation of energy by electromagnetic waves. Vector and scalar potentials; retarded potentials; plane and spherical waves; reflection and refraction; power flow and energy density; dispersion, scattering, and diffraction; fields in wave guides and resonant cavities. Mr. Carson.

E. E. 616, 617. Advanced Radio Engineering. 0-4-4
Prerequisites: E. E. 582, 615.

Analysis and design of transmitting, receiving, and measuring systems at microwave frequencies. Transmission lines, wave guides, and cavity resonators as circuit elements. Electronic methods of pulsing and timing with applications to pulse-time communication, television, navigation, radar, and measuring systems. Very broad-band amplifiers. Associated laboratory practice illustrating techniques of measurement and design at ultra-high and microwave frequencies. Mr. Carson.

E. E. 618. Radiation and Antennas. 0-0-4
Prerequisite: E. E. 615.

Electromagnetic wave theory applied to antennas and antenna arrays. Calculation and measurement of field patterns. Directive and non-directive antennas of various sorts. Mr. Carson.

E. E. 621. Physical Electronics. 3-0-0
Prerequisites: E. E. 416, 582; Math. 401.

Analysis of electron tube behavior and function in terms of electron action. Laws of electron motion, electronic and ionic conduction, electronic emission. Determination of potential fields. Electron optics. Basic tube types, including cathode-ray and photoelectric tubes. Mr. Carson.

E. E. 622. Vacuum Tube Design. 0-3-0
Prerequisites: E. E. 503, 621.

A study of the dependence of vacuum tube performance on construction and internal fields. An introduction to experimental tube construction and high vacuum practice is included. Mr. Carson.

E. E. 623. Transit Time Effects. 0-0-3
Prerequisites: E. E. 615, 621.

A study of vacuum tube operation as affected, at high frequencies, by the transit time of electrons across interelectrode space. Topics studied include noise in vacuum tubes, velocity-modulated tubes, magnetrons, and special tubes. Mr. Carson.

E. E. 631, 632, 633. Theory and Design of Electrical Machines. 3-3-3
Prerequisite: E. E. 402.

An advanced study of electrical machine theory. Saturation of magnetic circuits, leakage fluxes, loss distribution, and temperature rise. Transient and sub-transient reactances of synchronous machines. Stability and hunting of electrical machinery. Equivalent circuits of induction and synchronous machines. Commutation. Applications to design problems. Mr. Eckels.

E. E. 634. Transmission Line Transients. 0-0-4
Prerequisite: E. E. 501.

Guided traveling waves; their initiation, reflection, attenuation and distortion. Lightning and switching surges on lines. Protective devices.
Mr. Gauster.

E. E. 635. High Voltage Engineering. 3-0-0
Prerequisite: E. E. 527.

A study of the consideration entering the design of electrical equipment for use at high potentials. Insulators and insulation design. Corona loss and surface leakage. Methods of measurement and test at high potentials.
Mr. Gauster.

E. E. 636. Dielectrics and Insulating Materials. 0-3-0
Prerequisite: E. E. 402.

The behavior of electrical insulating materials as dielectrics. The theory of solids applied to dielectric conduction and breakdown. The electrical properties and uses of oils, silicates, plastics, ceramics, etc. Mr. Gauster.

E. E. 637, 638, 639. Power Systems. 3-3-3
Prerequisite: E. E. 528.

Network reduction, sequence impedances of lines and transformers, the calculation of fault currents and voltages by the method of symmetrical components. The study of machine reactances. The calculation of system stability with particular emphasis on the transient case. The application of circuit breakers and relays. Mr. Stevenson.

E. E. 643. Advanced Electrical Measurements. 3-0-0
Prerequisites: E. E. 303, E. E. 416.

A critical analysis of circuits used in electrical measurements, with special attention to such topics as balance convergence, effects of strays, sensitivity, and use of feedback in electronic devices. Mr. Hoadley.

E. E. 645, 646, 647. Advanced Electromagnetic Theory. 3-3-3
Prerequisite: E. E. 615 or Physics 602.

A comprehensive study of electricity and magnetism, emphasizing dynamic field theory. Potential theory, boundary-value problems, electrostatics and magnetostatics, conduction phenomena, wave propagation, electromagnetic theory of light. Mr. Gauster.

E. E. 650. Electrical Engineering Research. 3 to 9
Prerequisite: Graduate standing in E. E., and approval of adviser.

Individual research in the field of Electrical Engineering.
Graduate Advisers.

E. E. 661, 662, 663. Special Studies in Electrical Engineering. 3-3-3
Open only to candidates for the doctorate.

This course provides an opportunity for small groups of advanced graduate students to study, under the direction of qualified members of the professional staff, advanced topics in their special fields of interest.
Graduate Staff.

Engr. 100. Introduction to Engineering. 1-0-0

Introduces the student to the profession of engineering and the characteristics and requirements of the study of engineering. Mr. Lampe.

ENGINEERING MECHANICS

Courses for Advanced Undergraduates

E. M. 211. Applied Statics. 3-0-0

Prerequisite: Math. 103.

Required of all students in Architecture.

Statics: Study of the analytical and graphical solution of concurrent, parallel, and concurrent coplanar force systems; the determination of stresses in wall bearing trusses; parallel noncoplanar force systems; centroids and moments of inertia of plane areas; and the friction of wedges. Staff.

E. M. 213. Elements of Mechanics. 0-0-3

Prerequisite: Math. 103.

Required of Sophomores in Heating & Air Conditioning, and Construction.

Elements of statics; a study of the resultants, moments, and equilibrium of forces in a single plane: centroids, moments of inertia. Elements of dynamics; a study of displacement, velocity, acceleration, Newton's Laws of motion, rotation, and principles of work and energy. Staff.

E. M. 222. Applied Strength of Materials. 0-3-0

Prerequisite: E. M. 211.

Required of all students in Architecture.

Hooke's law, external shears and moments, the distribution of internal shearing and bending stresses, columns, the moment area theory of deflections. Staff.

E. M. 311. Engineering Mechanics. 3 or 3-0

Corequisite: Math. 201.

Required of all students in Engineering.

Statics and Friction: Study of concurrent, parallel, and nonconcurrent systems of both coplaner and noncoplaner forces; the application of statics to the solution of fundamental engineering problems, including statical friction. Staff.

E. M. 312. Engineering Mechanics. 0-3 or 3

Prerequisite: E. M. 311.

Required of all students in Engineering.

Kinematics; centroids, moments of inertia. Staff.

E. M. 313. Engineering Mechanics. 0-0-3

Prerequisite: E. M. 312.

Required of all students in Engineering.

Kinetics: The motions of particles of rigid bodies as they are affected by the action of unbalanced forces. The Newtonian laws of motion; work and energy; power, impulse and momentum; applications to special engineering problems. Staff.

E. M. 321. Strength of Materials. 3 or 3 or 3

Prerequisite: E. M. 312.

Required of all students in Engineering.

Stresses and strains in engineering materials; tension, compression, shear, and torsion; emphasis on the applications to engineering structures; bending moments and shear in simple beams; fibre stresses in beams and their distribution throughout the cross section. Staff.

E. M. 325. Elementary Strength of Materials. 3-0-0

Prerequisite: E. M. 213.

Required of juniors in Heating & Air Conditioning, and Construction.

Simple stresses and strains in tension, compression, and shear; riveted and welded joints; shear, and moments in beams; stresses and deflection in beams; columns. Staff.

E. M. 335. Fluid Flow. 0-3-0

Prerequisite: E. M. 213.

Required of juniors in Heating & Air Conditioning, and Construction.

Properties of fluids; intensity of pressure; hydrostatic pressure on areas; fundamentals of fluid flow through venturi meters, orfices, nozzles, tubes, and weirs; frictional flow in open and closed conduits; hydrodynamic forces. Messrs. Long, Myers.

E. M. 422. Strength of Materials. 3-0 or 3

Prerequisite: E. M. 321.

Required of students in Arch. E., C. E., M. E.

A continuation of E. M. 321. Various methods for finding the slope and deflection of beams; determination of stresses in statically indeterminate beams; the study of columns, combined stresses; energy of strain. Messrs. Smith, Mitchell, Hardee.

E. M. 430. Fluid Mechanics. 3 or 3 or 3

Prerequisite: E. M. 312.

Required of students in C. E., E. E., Geol. E., M. E.

A study of the fundamental principles of mechanics of fluids; properties of fluids; intensity of pressure; hydrostatic pressure on areas; applications of hydrostatics; kinematics of fluid flow; dynamics of fluid flow; applications of hydrokinetics; friction losses in pipes; flow through pipes; dynamic forces. Messrs. Long, Middleton.

Courses for Graduates and Advanced Undergraduates

E. M. 531. Hydraulic Machinery. 3 or 3-0

Prerequisite: E. M. 430.

Elective for Engineering seniors and graduate students.

The application of the principles of fluid mechanics to hydraulic pumping and power machinery; impulse and reaction type turbines; turbine laws and factors; pumping and machinery; centrifugal pumps, efficiency, capacity and selection of pumps. Mr. Long.

E. M. 551. Advanced Strength of Materials. 3-0-0
Prerequisite: E. M. 422.
Elective for Engineering seniors and graduate students.

A course offered as a basis for advanced subjects in the several departments of the Engineering School. The subject matter covers the studies of stress at a point by the use of Mohr's Circle, springs, curved bars, shear flow, and deformations beyond the elastic limit. Messrs. Smith, Mitchell.

E. M. 554. Vibration Problems. 0-0-3
Prerequisites: E. M. 422, Math. 401a or 401b.
Elective for Engineering seniors and graduate students.

Free vibrations without damping; forced vibrations without damping; free vibrations with viscous damping; forced vibrations with damping; steady state forced vibrations with damping; vibration of systems with several degrees of freedom; vibration isolation and absorption; vibrating instruments; equivalent systems; balancing. Messrs. Smith, Mitchell.

E. M. 556. Advanced Mechanics. 0-3-0
Prerequisite: E. M. 313.
Elective for Engineering seniors and graduate students.

Principle of virtual work; Coriolis' law of motion; gyroscopic action; balancing; variable acceleration; differential equations of motion; applications to engineering problems. Messrs. Smith or Long.

Courses for Graduates Only

E. M. 601. Strain Energy Methods of Stress Analysis. 0-3-0
Prerequisite: E. M. 422.

The application of strain energy for the evaluation of deflections and statically indeterminate reactions resulting from axial, transverse, and torsional loads on beams, trusses, rigid frames, and curved members.
Messrs. Smith, Mitchell.

E. M. 602. Elastic Stability. 0-0-3
Prerequisites: E. M. 422, Math. 401a or 401b.

A practical study of beams supported by an elastic foundation, beam columns, and buckling problems. The application to design problems in calculating critical loads on columns, beam columns, curved members, trusses, plates, and shells. Messrs. Smith and Mitchell.

E. M. 603. Introduction to Elasticity. 0-0-3
Prerequisites: E. M. 601, Math. 412.

Mathematical analysis of internal stresses in circular and rectangular plates. Problems involving symmetrical deformations, and stress concentrations. Messrs. Smith, Mitchell.

E. M. 605. Research in Strength of Materials. 3 to 9
Special problems and investigations. Graduate staff.

E. M. 606. Research in Mechanical Vibrations. 3 to 9
Special problems and investigations. Graduate staff.

E. M. 607. Research in Fluid Mechanics. 3 to 9
Special problems and investigations. Graduate staff.

E. M. 608. Advanced Fluid Mechanics. 3-0-0
Prerequisite: E. M. 430.
A study of more advanced problems than taken up in E. M. 430; resistance of immersed and floating bodies, the boundary layer theory, separation, effects of viscosity, skin friction; dynamics of fluids; special problems in fluid mechanics. Mr. Long.

E. M. 610. Engineering Mechanics Seminar. 1-1-1
Reports, discussions, and preparation of papers. Graduate staff.

E. M. 611, 612. Similitude for Engineers. 3-3-0
Prerequisites: E. M. 321, E. M. 430.
The study of the use of models as aids in engineering design; principles and methods of dimensional analysis; design, construction and testing of models; interpretation of results; use of models of beams and shafts under static and dynamic loading; applications to problems of fluid flow; distorted models; application to advanced problems in mechanics of elastic solids; dissimilar models. Mr. Long.

ENGLISH

Freshman English

Eng. 101, 102, 103. **Composition.** 3-3-3
Required of all freshmen.
Intensive practice in composition, with review in grammar and usage; reading and analysis of basic types of communication, with primary emphasis on comprehension; directed supplementary reading; oral and written reports; conferences. Staff.

Writing

Eng. 211. Business Correspondence 3 or 3 or 3
Prerequisite: Eng. 103.
Practical application of the principles of composition to effective business correspondence; intensive word study; collateral reading; reports.
Messrs. Shelley, Davis.

Eng. 215. Principles of News and Article Writing. 3 or 3 or 3
Prerequisite: Eng. 103. (Class limited to twenty students.)
Introduction to the writing of simple news articles; class criticism of non-technical newspaper and magazine articles. Mr. Whichard.

Eng. 216. Advanced Article Writing. 0-3 or 3
Prerequisites: Eng. 103, and 215 or equivalent.
A continuation of Eng. 215, with intensive practice in writing and criticizing nontechnical articles. Subjects determined by student's interest.
Mr. Whichard.

Eng. 217. Newswriting Laboratory. 3 or 3 or 3
Prerequisite: Eng. 215.

Supervised writing for college publications under direct supervision; class criticisms and forums on student writing. Not open to students holding paid positions with campus publications or radio station. Mr. Whichard.

Eng. 222. Advanced Composition. 0-3-0
Prerequisite: Eng. 103.

A course in creative writing especially designed for students who have demonstrated ability; emphasis on short prose fiction. Mr. Hartley.

Eng. 223. Vocabulary Building. 0-3-0
Prerequisite: Eng. 103.

Instruction in learning the meanings and uses of standard English words with the principal object of improving the student's vocabulary. Mr. Wynn.

Eng. 321. Technical Writing. 3 or 3 or 3
Prerequisites: Eng. 103, and junior standing.

Intensive practice in writing reports, articles, and papers for public delivery; readings in essays and in technical periodicals. Term papers.
Messrs. Fountain, Davis.

Speech

Eng. 231. Public Speaking. 3 or 3 or 3
Prerequisite: Eng. 103.

Speech organization and effective delivery; extempore speeches; audience motivation and use of motivating process; acquisition of ease before audience. Messrs. Paget, Fountain, Swain, Wynne.

Eng. 236. Parliamentary Practice. 0-3-0
Prerequisite: Eng. 103.

(Not to be counted toward the fulfillment of any requirement in English without specific authorization.)

Rules and customs of assemblies, including organization, motions; participation in and conduct of meetings; parliamentary strategy.
Mr. Paget.

Eng. 237. Speech Adjustment. 0-0-3
Prerequisite: Eng. 103.

Poise and pleasing communicative habits in all group contacts; habits of speech, posture, action, and language. Mr. Paget.

Eng. 331. Persuasion. 3-0-0
Prerequisite: Eng. 231 or equivalent.

Psychological forces, methods of conciliation, securing and holding attention, and winning response; extempore speeches and discussions.
Mr. Paget.

Eng. 332. Argumentation and Extemporaneous Speaking. 0-3-0
Prerequisite: Eng. 231 or equivalent.

Analysis, brief-drawing and evidence, and methods of proof and refutation; fundamentals of conviction; naturalness and forcefulness; extempore speeches, debates, and discussions. Mr. Paget.

Eng. 333. Public Address. 0-0-3

Prerequisite: Eng. 231 or equivalent.

Public speaking for special occasions, including speech of introduction, committee-room speech, after-dinner speech, speech at professional convention, political speech, formal sales talk. Mr. Paget.

Eng. 334. Radio Speaking. 3-0-0

(Not to be counted toward the fulfillment of any requirement in English.)

Prerequisites: English 231, or equivalent; approved admittance by the instructor.

Laboratory practice in the skills of radio speech; the physical properties of voice; diction; tempo; emotion. Mr. Swain.

Literature

Eng. 261, 262, 263. Backgrounds of English Civilization. 3-3-3, or 3 or 3 or 3

Prerequisite: Eng. 103.

A reading course in English literature offered as a year's sequence and at the same time so designed that a student may receive credit for separate terms. Chief masterpieces from Beowulf to the present day.

Mr. Clark.

Eng. 265, 266. The American Mind. 3-3-0, 0-0-3, or 3 or 3

Prerequisite: Eng. 103.

A two-term reading course designed to acquaint the student with the development of American thought and civilization as reflected in American writing. The course meets the requirements of the American Civilization group of the engineering humanities sequence. Open to students from all schools. Engineering students who so select will be required to take two terms, and to complete the sequence with History 122. Students from other schools may receive credit for separate terms of the 3-3-0 group. **Eng. 266 will be offered as a separate unit in the spring term for students in engineering only.** Messrs. Ladu, Kincheloe, Shackford, Walser.

Eng. 296, 297. Literature of the Western World. 3-3-0, 0-0-3, or 3 or 3

Prerequisite: Eng. 103.

A two-term reading course in the literature of the Western World designed to meet the requirements for the Western Civilization group of the humanities sequence in engineering but open to students from all schools. Engineering students who so elect will be required to take two terms, and to complete the sequence with Hist. 242. Students from other schools may receive credit for separate terms of the 3-3-0 group. **Eng. 297 will be offered in the spring term as a one-term unit for engineers who have elected Hist. 241 and 242 in the Western Civilization sequence.** Messrs. Hartley, Rulfs.

Eng. 367. Contemporary American Literature. 0-0-3

Prerequisite: Eng. 103.

A reading course in contemporary American literature.

Messrs. Ladu, Kincheloe, Shackford, Walser.

Eng. 371. The Novel. 3-0-0

Prerequisite: Eng. 103.

Analysis of representative novels of England and America, chosen to illustrate the development of the form and to provide a background for appreciating the modern novel. Staff.

Eng. 372. The Drama. 0-0-3

Prerequisite: Eng. 103.

A study of the drama as a literary type with particular reference to the contemporary theater. Staff.

Eng. 375. Southern Writers. 3-0-0

Prerequisite: Eng. 103.

An introduction to Southern culture as revealed in poetry from Poe to John Crowe Ransom and in the regional novel and short story; readings in the contemporary Southern essay dealing with social, political, and literary problems. Messrs. Marshall, Kincheloe.

Eng. 376. English Poetry, 1830-1900. 0-0-3

Prerequisite: Eng. 103.

A study of major poets writing in an age of scientific progress and social change with emphasis on Browning. Parallel readings and papers. Mr. Wynn.

Eng. 382. The Short-Story. 0-3-0

Prerequisite: Eng. 103.

An appreciation of the present-day short-story through examination of development, structure, type, and style; a comprehensive term paper, or its equivalent in original short fiction. Mr. Wynne.

Eng. 383. The Bible as Literature. 0-3-0

Prerequisite: Eng. 103.

Selected books of the Old and New Testaments (King James Version) as literary and historical documents. Mr. Ladu.

Eng. 385. Shakespeare. 0-0-3

Prerequisite: Eng. 103.

An analysis of the principal plays. Reports on parallel readings. Mr. Hartley.

Eng. 386. The Romantic Revolt. 0-3-0

Prerequisite: Eng. 103.

English literature from 1790 to 1830, with special emphasis on Wordsworth, Coleridge, Byron, Shelley, and Keats; collateral reading; reports. Mr. Clark.

Eng. 391. The Age of Reason. 0-3-0

Prerequisite: Eng. 103.

Chief currents of thought in English literature of the eighteenth century. Mr. Hartley.

Eng. 392. Contemporary British Literature. 0-0-3

Prerequisite: Eng. 103.

An introduction to chief figures in contemporary British literature. Collateral readings; term paper. Mr. Ladu.

ENTOMOLOGY

Courses for Undergraduates

Ent. 302. Economic Entomology. 0-4 or 4

Prerequisite: Zoology 102.

The insects and their near relatives including their economic importance and the principles of control. Mr. Mitchell.

Ent. 311. Introduction to Forest Insects. 4-0-0

Prerequisite: Zoology 102.

An introductory course designed for students majoring in Forestry. Mr. Mitchell.

Ent. 322. Beekeeping. 0-0-3

Prerequisite: Ent. 302 or 311.

General principles of the colony and its operation. Mr. Stephen.

Courses for Graduates and Advanced Undergraduates

***Ent. 501, 502, 503. Insect Biology.** 3-3-3

Prerequisite: Ent. 302 or 311 or equivalent.

Life histories, reproduction, growth, metamorphosis, protection, food relations, hibernation, social relations and adaptations. Given 1953-54. Mr. Mitchell.

Ent. 511, 512, 513. Systematic Entomology. 3-3-3

Prerequisite: Ent. 302 or 311 or equivalent.

The classification, habits and development of insects. Includes techniques of collection, methods of mounting and preparation, and use of keys. The student is expected to develop a familiarity with the orders and principal families of insects and to develop the ability to recognize each major group. Mr. Mitchell.

***Ent. 521, 522, 523. Insect Morphology.** 3-3-3

Prerequisite: Ent. 302 or Ent. 311 or equivalent.

External and internal morphology of insects. Given 1953-54. Mr. Metcalf.

***Ent. 531, 532, 533. Insect Ecology and Behavior.** 3-3-3

Prerequisite: Ent. 302 or Ent. 311.

Environmental factors, biotic interrelations, orientations, instinctive activities, and distribution by communities. Given 1954-55. Mr. Fulton.

***Ent. 542, 543. Immature Insects.** 0-3-3

Prerequisite: Ent. 511 or permission of instructor. Methods of collecting, preserving, and determining immature insects. 542 will deal primarily with the taxonomy of the orders with some work on the more important families. 543 will deal with classification to families with some work on genera and species. Given 1954-55. Mr. Smith.

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* Given in alternate years.

*Ent. 552. Entomological Technique. 0-3-0

Prerequisite: Ent. 302 or Ent. 311 or equivalent.

Methods of collecting and preserving insects; rearing techniques; entomological drawing and other methods of illustrating; a study of insecticide equipment for laboratory and field research. Given 1954-55. Staff.

*Ent. 561, 562, 563. Applied Entomology. 3-3-3

Prerequisite: Ent. 302 or 311 or equivalent.

General principles of chemical, biological and cultural control of insects with special emphasis on contact insecticides, stomach poisons and fumigants. Given 1953-54. Mr. Fulton.

*Ent. 571. Biological Control of Insects. 3-0-0

Prerequisite: Ent. 513 or equivalent.

Insect parasites and predators, diseases of insects, methods of rearing and disseminating insects for biological control. Given 1954-55. Staff.

Ent. 572. Insect Pests of Vegetable Crops. 0-3-0

Prerequisite: Ent. 302 or equivalent.

A survey of the more important truck crop pests, their life histories and principles of control.

Ent. 573. Fruit Insects. 0-0-3

Prerequisite: Ent. 302 or equivalent.

Detailed study of the pests of pome, stone and small fruits, their life histories and principles of control. Mr. Smith.

Ent. 581. Insect Pests of Field and Forage Crops. 3-0-0

Prerequisite: Ent. 302 or equivalent.

Detailed study of field and forage crop insects, their life histories and control. Mr. Kulash.

Ent. 582. Forest Entomology. 0-3-0

Prerequisite: Ent. 302 or 311 or equivalent.

Insects of forests and forest products with emphasis on the factors governing abundance and the application of this knowledge in control.

Mr. Kulash.

*Ent. 593. Medical Entomology, See Zool. 593. 0-0-3

Prerequisite: Permission of the instructor.

A study of the morphology, biology, and control of the parasitic arthropods of man, domestic, and wild animals. Given 1953-54. Mr. Harkema..

Courses for Graduates Only

*Ent. 601, 602, 603. Principles of Taxonomy. 3-3-3

Prerequisite: Ent. 513 or equivalent.

Taxonomic literature, bibliographic methods, codes of nomenclature, zoogeography, taxonomic concepts, handling research material and constructing keys and descriptions. Staff

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* Given in alternate years.

***Ent. 612. Insect Physiology.** 0-5-0

Prerequisites: Permission of instructor.

General principles of insect physiology with experimental studies on nutrition, digestion, excretion, circulation, respiration, and the nervous system of insects. Given 1953-54. Mr. Gast.

***Ent. 622. Insect Toxicology.** 0-5-0

Prerequisites: Permission of instructor.

General principles of insect toxicology and the chemistry and biological activity of insecticides. The laboratory work will consist of a series of chemical and biological experiments designed to illustrate and supplement the lecture material. Given 1954-55. Mr. Gast.

Ent. 641. Seminar. One credit per term

Prerequisite: Graduate standing in Entomology.

Scientific articles, progress reports in research, and special problems of interest to entomologists reviewed and discussed.

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate. Staff.

Ent. 651. Research. Credit by arrangement

Prerequisite: Graduate standing in Entomology.

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

FORESTRY

Courses for Undergraduates

For. 101. Forestry and Conservation. 2-0-0

The profession of Forestry and opportunities for employment of trained personnel. Mr. Preston.

For. 102. Forestry and Conservation. 0-0-2

A survey of our natural resources together with the policies and programs which have been adopted for their protection and use.

Mr. Preston.

For. 201. Wood Structure and Identification. 3-0-0

Identification, structure, properties and uses of woods of economic importance in the United States; identification by means of the hand lens is especially emphasized. Mr. Slocum.

For. s204. Silviculture. 3 credits

Sophomore Summer Camp.

Growth and development of forest stands; reproduction counts, type mapping, thinning and weeding; establishment and measurement of sample plots. Mr. Miller.

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* Given in alternate years.

For. s214. Dendrology. 1 credit
Sophomore Summer Camp.
Identification and study of trees in piedmont and mountain sections of North Carolina. Mr. Slocum.

For. s274. Mensuration. 3 credits
Sophomore Summer Camp.
Prerequisite: C. E. 201 or 209.
Collection of field data for stand and yield tables, stem analysis, and timber surveys. Mr. Slocum.

For. s284. Wood-Using Industries. 2 credits
Sophomore Summer Camp.
Field study of wood-using industries, lumber manufacturing and seasoning, and logging equipment and methods. Staff.

For. 302. Physical Properties of Wood. 0-0-3
Prerequisite: Physics 215 or equivalent.
The properties of wood as they are related to moisture, heat, light, sound and electricity. Emphasis is placed on the relationship of physical properties to use of the wood and to the way in which it is processed.
Mr. Stecher.

For. 303. Wood-Moisture Relations. 0-0-3
Prerequisite: For. 201.
Shrinking and swelling characteristics of wood; air seasoning; dry kiln construction; kiln operation; schedules and conditioning; lumber storage and moisture control during manufacture; dimensional stabilization methods, processes, equipment, and materials. Mr. Carter.

For. 311. Principles of Farm Forestry. 3 or 3-0
The theory and practice of forestry with special reference to the handling of farm woodlands and the utilization of their products; the place of forestry in farm management and the agricultural economy.
Mr. Bryant.

For. 313. Forest Industries. 0-0-3
Senior Camp.
A field study of logging, milling and manufacturing with reports based on inspection trips. Staff.

For. 321, 322, 323. Pulp and Paper Technology. 3-3-3
Brief survey of the physical and chemical characteristics of wood and cellulose. Chemistry and technology of the major mechanical, chemical and semi-chemical processes employed in the manufacture of pulp and paper.
Mr. Libby.

For. 333. Management Plans. 0-0-4
Senior Camp.
Application of management, logging, silvicultural and utilization practices on assigned areas. Each student must make a forest survey of an individual area and submit a report. Staff.

For. 343. Forest Protection and Improvements. 0-0-3
Senior Camp.

Organization and operation of forest fire prevention and control methods; effect of weather on fire conditions; forest road and telephone line construction and maintenance. Staff.

For. 361. Silvics. 0-0-3

The factors of site in their relation to the occurrence and development of forest types; the effect of forest cover on the site. Mr. Maki.

For. 363. Field Silviculture. 0-0-4
Senior Camp.
Prerequisites: For. 361, 342.

Studies of forest communities; dendrology of the coastal section of North Carolina; silviculture practices. Mr. Miller.

For. 372. Mensuration. 0-5-0
Prerequisite: For. s274.

The measurement of timber, both standing and felled; log rules, form factors, stem analysis, and growth; methods of making volume, growth, and stand tables; increment and yield studies; development of stand and yield tables from field data. Mr. Slocum.

For. 373. Forest Inventory. 0-0-4
Senior Camp.

Practical field work in timber estimating and compilation of field data. Mr. Slocum.

For. 401. Preservation and Waste Reduction. 0-0-4

Factors causing wood deterioration; preservative materials and treatments; wood byproducts from mill and forest waste. Messrs. Stecher, Wyman.

For. 402. Foundations of Forest Management. 0-3-0
Prerequisites: For. s274 or For. 311.

The integration of silviculture, forest measurements and economics in the management of woodland areas. (Not open to students majoring in forest management). Mr. Bryant.

For. 403. Paper Technology Laboratory. 0-0-3

Development of various types of paper furnishes with particular attention to stock preparation, sizing, filling and coloring. The finished products are tested physically and chemically and evaluated from the standpoint of quality and in comparison with the commercial products they are intended to duplicate. Mr. Libby.

For. 411. Pulp and Paper Making Machinery. 3-0-0

Principles of operation, construction and design of process equipment employed in the pulp and paper industry. Mr. Libby.

For. 413. Paper Testing Laboratory. 0-0-3

Physical, chemical and microscopical examination of experimental and commercial papers and evaluation of the results in terms of the utility of the products tested. Mr. Libby.

For. 421. Log and Lumber Grades and Specifications. 3-0-0
Log and bolt grades and specifications in use; log grades based upon lumber grades; lumber grading principles and practices for hardwoods and softwoods. Mr. Wyman.

For. 422. Forest Products. 0-3-0
Prerequisites: For. 201, Chem. 203 or 426.
The source and method of obtaining derived and manufactured forest products other than lumber. Mr. Wyman.

For. 423. Logging. 3-0-0
Timber harvesting and transportation methods, equipment and costs; application of methods and mechanized equipment to specific conditions and regions; safety and supervision in logging. Mr. Wyman.

For. 431. Naval Stores. 0-3-0
Prerequisite: Chem. 203.
Methods of turpentining woods practices; factors influencing oleoresin yields; distilling practices; integration with other forest products utilization. Mr. Wyman.

For. 432. Merchandising Forest Products. 0-3-0
Principles and practices in the distribution and marketing of the products obtained from wood; organization and operation of retail, concentration and wholesale outlets. Mr. Carter.

For. 433. Gluing and Plywood. 3-0-0
Veneer manufacturing methods and equipment; veneer products; cold-press and hot-press bonding adhesives; processing and use requirements; cause and prevention of inadequate bonds; molded, flat and post-formed plywood construction. Mr. Bethel.

For. 441. Wood Machining and Equipment. 0-0-3
Prerequisites: For 201, 303.
Machining characteristics of woods; knife and saw angles, speeds and feeds for various machines and wood conditions; machinery construction, operation, maintenance. Application of types of equipment to specific operations in furniture, plywood and other wood-working plants. Mr. Bethel.

For. 442. Lumber and Dimension Stock Manufacturing. 3-0-0
Short and long log types of sawmills and milling practices; manufacturing methods and equipment for turned products, novelties, and special shaped dimension; manufacture and milling operations for hardwood dimension stock and softwood cut stock; transportation and handling methods. Mr. Stecher.

For. 443. Wood Finishing. 0-0-3
Prerequisites: For. 201, Chem. 203 or 426.
Preparation of wood surfaces for finish coatings; composition and application of paints, varnishes, repellents, lacquers, and other wood finishing materials; finishing furniture and interior wood products. Mr. Carter.

For. 451. Paper Coloring. 2-0-0
Evaluation and identification of dyestuffs and the development of color formulas for dyeing pulp and paper. Mr. Libby.

For. 452. Forest Grazing. 0-0-3
Management of range areas, all grazing regions with special consideration of the southeast. Mr. Maki.

For. 453. Lumber Structures. 0-3-0
Structural grades of lumber; working stresses; frame construction; construction estimates and computations; masonry, insulation, roofing and other structural materials; millwork; fastenings; prefabs. Mr. Wyman.

For. 461. Paper Converting. 0-3-0
A survey of the principal processes by which paper and paper board are fabricated into the utilitarian products of everyday use. Mr. Libby.

For. 462. Artificial Forestation. 0-3-0
Production, collection, extraction, and storage of forest tree seeds; nursery practice; field methods of planting. Mr. Slocum.

For. 463. Mill Inspections. 0-0-1
One week inspection trip covering representative manufacturers of pulp and paper and papermaking equipment. Mr. Libby.

For. 471, 473. Pulp Technology Laboratory. 3-3-0
Preparation and evaluation of the several types of wood pulp. The influence of the various pulping and bleaching variables on pulp quality are studied experimentally and these data evaluated critically. Mr. Libby.

For. 472. Forest Policy and Administration. 3-0-0
Civil timber law, illustrated by court cases; state and federal forest policy; job-load analysis in national forest administration. Mr. Miller.

For. 482, 483. Pulp and Paper Mill Management. 0-2-2
A survey of the economics of the pulp and paper industry is followed by a study of the work of the several departments of a paper mill organization and the functions of the executives who administer them. Mr. Libby.

For. 491, 492. Pulp Testing Laboratory. 1-1-0
Evaluation of experimental and commercial wood pulps for such properties as color, bleachability, freeness, strength, viscosity, alpha cellulose content, etc. Mr. Libby.

Courses for Graduates and Advanced Undergraduates

For. 501. Forest Valuation. 4-0-0
The theory and techniques of valuation of forest land, timber stands, and forest practices as investments and for appraisals of damages. The evaluation of risks and hazards in forestry as they apply to forest investments, forest insurance, and forest taxation. Mr. Bryant.

For. 511. Regional Silviculture. 5-0-0

The principles and application of intermediate and reproductive methods of cutting; controlled burning, silvicides, and other methods of hardwood control. The application of silvicultural methods in the forests of the United States. Mr. Miller.

For. 512. Forest Economics. 0-3-0

Economic and social value of forests; supply of, and demand for forest products; land use; forestry as a private and a public enterprise; economics of the forest industries. Mr. Bryant.

For. 513. Tropical Woods. 0-0-3

Structure, Identification, Properties, characteristics and use of tropical woods, especially those used in plywood and furniture. Mr. Bethel.

For. 523. Furniture Construction and Assembly. 0-3-0

Prerequisites: For. 303, 322.

Stock preparation for gluing; selecting adhesives; types of metal fastenings; joint construction and methods of joining wood and other materials; assembly methods for furniture and other wood products; construction and strength properties of laminated members. Mr. Carter.

For. 531. Forest Management. 0-5-0

Prerequisite: For. 372.

Management of timber lands for economic returns; the normal forest taken as the ideal; the application of regulation methods to the forest. Mr. Maki.

For. 533. Advanced Wood Structure and Identification. 3-0-0

Prerequisite: For. 201.

Advanced microscopic indentification of the commercial woods of the United States and some tropical woods; microscopic anatomical features and laboratory techniques. Mr. Slocum.

For. 541. Mechanical Properties of Wood. 3-0-0

Prerequisites: For. 201, 303.

Strength and related properties of commercial woods; standard A.S.T.M. strength tests; toughness; timber fastenings; structural requirements; working stresses. Mr. Wyman.

For. 542. Fiber Analysis. 3-0-0

Fiber microscopy; the determination of fiber measurement, quality, variation and identity in pulp woods. Mr. Bethel.

For. 543. Pulping Processes and Products. 0-3-0

Prerequisites: For. 201, Chem. 203 or 426.

Fiber manufacturing processes and equipment; wall, insulation and container board products; manufacture of roofing felts; pulp products manufacturing; resin treated and specialty products, lignin and wood sugar products. Mr. Libby.

For. 553. Forest Photogrammetry. 0-3-0
Interpretation of aerial photographs, determintion of density of timber stands and area mapping. Mr. Slocum.

For. 563. Quality Control in Wood Product Manufacture. 0-0-3
Prerequisites: Stat. 461 or 412.

A study of methods used to control quality of manufactured wood products. Emphasis is placed on the use of control charts for variables and attributes and on acceptance sampling techniques including single, double and sequential sampling methods. Mr. Bethel.

For. 573. Methods of Research in Forestry. 0-0-3
Methods of procedures, problem outlines, presentation of results; consideration of selected studies by forest research organizations; sample plot technique. Mr. Maki.

For. 591, 592, 593. Forestry Problems. 1-5, 1-5, 1-5
Assigned or selected problems in the field of silviculture, logging, lumber manufacturing, pulp technology, or forest management. Staff.

Courses for Graduates Only

For. 601, 602, 603. Advanced Forest Management Problems. 1-5, 1-5, 1-5
Directed studies in forest management. Staff.

For. 611, 612, 613. Advanced Silviculture Problems. 1-5, 1-5, 1-5
Advanced problems or experiments in silviculture. Staff.

For. 621, 622, 623. Advanced Logging Problems. 1-5, 1-5, 1-5
Selected research in logging problems of an advanced nature. Staff.

For. 631, 632, 633. Advanced Lumber Manufacturing Problems. 1-5, 1-5, 1-5
Selected problems in the field of lumber, dimension stock, cut-stock and specialty products manufacture, seasoning and milling. Staff.

For. 641, 642, 643. Advanced Utilization Problems. 1-5, 1-5, 1-5
Problems of an advanced grade in some phase of forest utilization. Staff.

For. 651, 652, 653. Forest Valuation Problems. 1-5, 1-5, 1-5
Planning, organizing, and conducting, under general supervision, an important research project in one of the fields of valuation. Staff.

For. 661, 662, 663. Wood Fabrication Problems. 1-5, 1-5, 1-5
Original research and study on special projects directed toward problems in gluing, assembly, and machining or other phases of fabrication for a thesis. Staff.

For. 671, 672, 673. Problems in Research. 1-5, 1-5, 1-5
Specific forestry problems that will furnish material for a thesis. Staff.

For. 681. Graduate Seminar. 1-1-1
Prerequisite: Graduate standing in Forestry or closely allied fields.

Presentation and discussion of progress reports on research, special problems, and outstanding publications in forestry and related fields. Staff.

GENETICS

Courses for Advanced Undergraduates

Gen. 411. The Principles of Genetics. 5-0 or 5

Prerequisite: Bot. 102 and Zool. 101.

Basic principles of heredity and variation. Students conduct breeding experiments and study inheritance in various animals and plants.

Messrs. Bostian, Grosch.

Courses for Graduates and Advanced Undergraduates

Gen. 512 Genetics 0-3-0

Prerequisite: Gen. 411.

Intended for students desiring more thorough and detailed training in fundamental genetics than provided by Gen. 411, with some attention to recent advances. Mr. Grosch.

Gen. 513. Cytogenetics I. 0-5-0

Prerequisite: Gen. 512 (or concurrent registration).

Variations in the chromosomal mechanisms of inheritance and their genetic consequences. The chromosomes as they affect breeding behavior in plants and animals. Lecture and laboratory. Mr. Smith.

****Gen. 520. Principles of Evolution.** 0-3-0

Prerequisite: Gen. 512.

The theory of evolution and its biological foundation. Forces responsible for evolution; the effects of variation, isolation and selection on genetic populations. Mr. Gregory.

Courses for Graduates Only***

***Gen. 614. Cytogenetics II.** 0-0-5 (3)

Prerequisite: Gen. 512. Recommended: Gen. 513.

Cytogenetic processes in evolution and their analysis.

Lecture and laboratory (optional). Mr. Smith.

***Gen. 615. Cytology.** 3-0-0

Prerequisite: Gen 512.

The organization and reproduction of nuclei and cells with consideration of the current theories of chromosome structure, mechanics, and behavior.

Mr. Smith.

***Gen. 616. Cytological Laboratory.** 2-0-0

Prerequisite: Experience or class work in microtechnique; concurrent registration in Gen. 615.

Cytological preparations and their analysis; demonstrations and student materials illustrating Gen. 615. Mr. Smith.

***Students are expected to consult the instructor before registration.

*Given in odd years.

**Given in even years.

Gen. 620. Genetic Concepts of Speciation.[**] 0-0-3

Prerequisite: Gen. 512 and 513.

A review of the request literature concerned with the nature of species and species formation.

Gen. 633. Physiological Genetics.[*] 0-0-3

Prerequisite: Gen. 512.

Recent advances. Attention is directed to literature on the nature and action of genes, and to the interaction of heredity and environment in the expression of the characteristics of organisms. Mr. Grosch.

Gen. 634. The Genetic and Cytological Effects of Environmental Agents.[**] 0-0-3

Prerequisite: Gen. 512.

A review of the literature on the induction of changes in cytogenetic mechanisms by chemical and physical means with emphasis of analytical aspects. Mr. Grosch.

Gen. 641. Research in Genetics. Credits by arrangement.

Prerequisite: Graduate standing in Genetics; consent of instructor.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate program. Staff.

Gen. 651. Seminar. One Credit per term.

Prerequisite: Graduate Standing.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate program. Staff.

The following courses are offered by cooperating departments:

Agron. 413. Plant Breeding.
A. I. 502. Animal Breeding.
A. I. 626. Advanced Animal Breeding.
Hort. 542 Breeding of Horticultural Plants.
Poul. 520. Poultry Breeding.
Poul. 601. Advanced Poultry Genetics.
Stat. 624, 626. Statistical Concepts in Genetics.

GEOGRAPHY

Courses for Undergraduates

Geog. 201, 202. Geography. 3-3-0

Elective.

A course covering the principal elements of physical and human geography. Mr. Shulenberger.

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[*] Given in odd years.
[**] Given in even years.

GEOLOGY

Courses for Undergraduates

Geol. 101. Earth Science. **0-3-0**

Elective. Not to be taken after Geol. 120, and 222.

Introductory course in General Geology: changes in the earth, and underlying physical and life processes. Mr. Stuckey.

Geol. 120. Physical Geology. **4 or 4 or 4**

Dynamic processes acting on and within the earth; materials and make-up of the earth's crust; emphasis on engineering and agricultural applications in the southeast. Lectures, laboratories, and field trips. Staff.

Geol. 207. Ex. Physical Geography. **3-3-0**

A. The processes and forces involved in the development of land forms.

B. The physiographic provinces of the United States and their importance; physical geography of North Carolina. Mr. Stuckey.

Geol. 222. Historical Geology. **0-4-0**

Prerequisite: Geol. 120.

Required of sophomores in Geological Engineering.

Major events in the history of North America; rise and development of main animal and plant groups. Lectures, laboratories and field trips. Mr. Steel.

Geol. 230. Mineralogy. **4-0 or 4**

Prerequisite: Chem. 103.

Required of sophomores in Geological Engineering and juniors in Ceramic Engineering.

Crystallography, and physical and chemical mineralogy. Lectures and laboratory work. Messrs. Stuckey, Miller.

Geol. 323. Paleontology. **4-0-0**

Prerequisite: Geol. 222.

Required of juniors in Geological Engineering.

Designed to give a knowledge of past life with major emphasis on classification and structure of the invertebrate animals and their application to problems of correlation. Lectures, laboratories and field trips. Mr. Steel.

Geol. 325. Geology and Mineral Resources of North Carolina. **0-3 or 3**

Prerequisite: Geol. 120.

Physical geography, general geology, common rocks and minerals, and mines and quarry products of the State. Lectures, laboratories, and field trips. Mr. Steel.

Geol. 332. Advanced Mineralogy. **2-0-0**

Prerequisite: Geol. 230

Required in Geological Engineering.

A continuation of Geol. 230. Special attention to the crystallographic and chemical properties of the more important and difficult mineral groups. Lectures and laboratory work. Messrs. Stuckey, Miller.

Geol. 351. Structural Geology. 0-0-4
Prerequisite: Geol. 120.
Required in Geological Engineering.
The arrangement and deformation of the different rock masses composing the earth's crust. Lectures, laboratories and field trips. Mr. Parker.

Geol. 370. Mining Methods. 0-0-4
Prerequisite: Geol. 351.
Required of juniors in Geological Engineering.
Introduction to mining; study of the various methods of exploitation of rock and mineral deposits and bases for choice of any particular method from both the geologic and the economic standpoint. Mr. Miller.

Geol. 412, 413. Economic Geology. 0-3-3
Prerequisites: Geol. 120 and 230; Chem. 103.
Required of seniors in Geological Engineering.
Mode of occurrence, association, origin, distribution, and uses of economically valuable minerals. Lectures, laboratories, and field trips.
Mr. Stuckey.

Geol. 443. Petrology. 0-4-0
Prerequisites: Geol. 120 and 230.
Required of juniors in Geological Engineering.
Materials of the earth's crust; composition, texture, classification, megascopic identification, and alterations of the principal igneous, sedimentary, and metamorphic rocks. Lectures, laboratories, and field trips.
Mr. Parker.

Geol. 462. Engineering Geology. 0-3-0
Prerequisite: Geol. 120.
Required of seniors in Geological Engineering.
The application of geologic principles to engineering practice; analysis of geologic factors and processes affecting specific engineering projects.
Mr. Miller.

Geol. 463. Geological Surveying. 0-0-4
Prerequisites: Geol. 351 and 443.
Required of seniors in Geological Engineering.
Methods of field observation and use of geologic surveying instruments in surface and underground work; representation of geologic features by maps, sections and diagrams. Lectures, laboratories, and field work.
Messrs. Parker, Miller.

Courses for Graduates and Advanced Undergraduates

Geol. 510. Mineral Industry. 0-0-3
Prerequisite: Permission of Instructor.
Required in fifth year of Geological Engineering.
Economics of mineral industry. Cycles of mineral production. Exhaustibility. Reserves. Valuation of mineral property. National resources; essential, critical, and strategic minerals. World distribution and production.
Messrs. Parker, Steel.

Geol. 515. Petroleum Geology. 0-0-3

Prerequisite: Geol. 351 and 443.

Required in fifth year of Geological Engineering.

Properties, origin and modes of occurrence of petroleum and natural gas. Geologic and economic features of the principal oil and gas fields, mainly in the United States. Staff.

Geol. 522. Stratigraphy and Index Fossils. 0-3-0

Prerequisite: Geol. 323.

Required in fifth year of Geological Engineering.

Character, distribution, sequence, correlation and conditions of origin of the major sedimentary formations in the southeastern U. S. Key fossils characteristic of each period. Lectures, laboratories and field trips. Staff.

Geol. 531, 532. Optical Mineralogy. 3-3-0

Prerequisites: Geol. 230 and Phys. 203.

Required of seniors in Geological Engineering and in fifth year of Ceramic Engineering.

Optical principles involved in the petrographic (polarizing) microscope and related instruments. Microscopic determination of minerals in thin section and in fragments. Lectures and laboratory work. Messrs. Stuckey, Parker, Steel.

Geol. 551. Sedimentation. 3-0-0

Prerequisite: Geol. 443.

Required in fifth year of Geological Engineering.

Formation of sediments and sedimentary rocks, including their kinds, structures, sources, transportation, mode and environment of deposition. Mr. Parker.

Geol. 553, 554. Geophysics. 0-3-3

Prerequisites: Geol. 351, Phys. 203.

Required in fifth year of Geological Engineering.

Discussion of the fundamental principles underlying all geophysical methods; procedure and instruments involved in gravitational, magnetic, seismic, electrical and other methods of studying geological structures and conditions; study of applications and interpretations of results. Mr. Miller.

Geol. 571, 572, 573. Mining and Mineral Dressing. 3-3-3

Prerequisite: Geol. 470.

Required in fifth year of Geological Engineering.

Principles of the mineral industry; mining laws, prospecting, sampling, developments, drilling, blasting, handling, ventilation and safety; administration, surveying, assaying; preparation, dressing and marketing. Mr. Miller.

Geol. 580. Geomorphology. 3-0-0

Prerequisite: Geol. 443.

A systematic study of land forms and their relations to processes and stages of development and adjustment to underlying structure. Lectures, map interpretations, and field trips. Mr. Steel.

Courses for Graduates Only

Geol. 611, 612. Advanced Economic Geology. 3-3-0
Prerequisites: Geol. 412, 413.
Required in fifth year of Geological Engineering.
Detailed study of the origin and occurrence of specific mineral deposits.
Mr. Stuckey.

Geol. 633. Microscopic Determination of Opaque Minerals. 0-0-3
Prerequisites: Geol. 332 and 532.
Identification of metallic, opaque minerals in polished sections by physical properties, etch reactions and microchemical tests. Laboratories.
Mr. Steel.

Geol. 643. Advanced Petrography. 0-0-3
Prerequisites: Geol. 443, 532.
Application of the petrographic microscope to the systematic study of the composition and origin of rocks; emphasis on igneous and metamorphic rocks. Messrs. Stuckey, Parker.

Geol. 681, 682, 683. Seminar. 1-1-1
Prerequisite: Graduate standing.
Scientific articles, progress reports and special problems of interest to geologists and geological engineers discussed. Staff.

Geol. 691. Geological Research. 3 to 9
Prerequisite: Permission of the Instructor.
Lectures, reading assignments, and reports; special work in Geology to meet the needs and interests of the students. Staff.

HISTORY AND POLITICAL SCIENCE

Courses in History

Hist. 101, 102, 103. Economic History. 3-3-3
Required of freshmen in Industrial Education, elective by separate terms for others.
A survey of the development of economic life in the United States, beginning with the European background and extending to the present.
Mr. Seegers.

Hist. 111, 112, 113. World History. 2-2-2
A general survey of Western civilization from its beginning to the present day. The terms divide in the fifth and seventeenth centuries and may be taken independently. Mr. Barnhardt.

Hist. 121, 122. United States History. 3-3-0 or 3-0-3 or 0-3-3
Prerequisites for engineering students only: Eng. 103 and S. S. 103 or acceptable substitutes.
Required of students in the Schools of Agriculture, Textiles, and Education (except Industrial Education). Elective for other students. Engineering students who choose to do their sophomore humanities work in the American

Civilization group of courses must take Hist. 121 and 122 and Eng. 266, or Eng. 265 and 266 and Hist. 122 (See this catalog, page 125).

A study of major historical developments in the growth of the American nation. The course opens with a consideration of our colonial heritage and the terms divide at 1865.

Hist. 211. The American Colonies and the Confederation. 3 credits

A survey of American political and social history to 1787.

Hist. 212, 213. The United States Since 1787. 3 credits each

A survey of American history from the Constitutional Convention to the present time, dividing at the end of Reconstruction. The terms may be taken separately.

Hist. Ex. 216. Medieval History. 3 credits

A survey of the political, social, economic, ecclesiastical, and cultural history of Europe from the fourth century to the close of the fifteenth century. Mr. Barnhardt.

Hist. 221. History of Modern Europe. 3 credits

A survey of the economic, political, and social developments in Europe from the age of the great discoveries to the close of the eighteenth century. Mr. Barnhardt.

Hist. 222. History of Modern Europe. 3 credits

A survey of European history during the nineteenth century, political, economic, and social movements being emphasized in proportion to their international or European importance. Mr. Barnhardt.

Hist. 223. Contemporary Europe. 3 credits

A survey of the contemporary history of the principal European states and their international relations in the twentieth century. Mr. Barnhardt.

Hist. 241, 242. Western World in Modern Times. 3-3-0 or 3-0-3 or 0-3-3

Prerequisites for engineers only: Eng. 103 and S. S. 103 or acceptable substitutes.

Engineering students who choose to do their sophomore humanities work in the Western Civilization group of courses must take Hist. 241 and 242 and Eng. 297, or Eng. 296 and 297 and Hist. 242. (See this catalog, page 125). Students in other curricula may elect either or both terms.

A study of the principal historical movements in the modern Western World. The terms divide at 1870. Staff.

Hist. 306. North Carolina History. 3-0 or 3

A general survey of the political, social, economic, and cultural developments in North Carolina, with special emphasis on the nineteenth and twentieth centuries. Mr. Barnhardt.

Hist. Ex. 310, 311, 312. Economic and Social History of the South. 9 credits

A study of the economic and social history of the Southern States. Lectures, readings, and reports. Mr. Rice.

Hist. Ex. 320. American Biography. 3 credits
Representative men and women in American politics, law, religion, agriculture, industry, commerce, science, literature, and art. Mr. Raab.

Hist. 333. History of American Agriculture. 0-3-0
Main trends in agriculture in the United States, and the place of agriculture in the economic life of the nation; special emphasis on the period since the Civil War. Mr. Seegers.

Hist. 340. History of Modern England. 3 credits
Survey of English political, social, economic, and diplomatic history, with emphasis on the nineteenth and twentieth centuries. Mr. Barnhardt.

Hist. Ex. 350. Hispanic American History. 3 credits
A brief account of the colonial period and wars for independence, followed by more or less detailed study of the various Hispanic American republics, with emphasis upon their relations with the United States.

Hist. 360. Recent History of the United States. 0-0-3
Significant developments in the United States since 1914, with particular emphasis on post-war problems, foreign affairs, and the New Deal.
Mr. Raab.

Course for Graduates and Advanced Undergraduates

Hist. 534. (Same as Rural Soc. 534). Farmers' Movements. 0-0-3
The origin, growth, and present status of such national farmers' organizations and movements as the Grange, the Farmers' Alliance, the Populist Revolt, the Farmers' Union, the Farm Bureau, the Society of Equity, the Nonpartisan League, and cooperative marketing. Mr. Noblin.

COURSES IN POLITICAL SCIENCE

Pol. Sc. 211. American Government. 3 or 3 or 3
Required of students in Agriculture, Agricultural Education, Industrial Arts Education, and Industrial and Rural Recreation.

A survey of the origins, structure, and functions of the government of the United States. Staff.

Pol. Sc. 212. State Government and Administration. 0-3-0
A study of Federal-State relations, and the organization and administration of state and county governments. Special attention will be given to problems of government in North Carolina. Mr. Raab.

Pol. Sc. 213. Municipal Government and Administration. 0-0-3
A study of the history, organization, and administration of American municipal corporations. Mr. Kolb.

Pol. Sc. Ex. 221. American Political Parties. 3-0-0
The origin and development of political parties in the United States: their functions, organization, regulation, campaign methods, and elections.
Mr. Edsall.

Pol. Sc. 231. European Governments. 0-3-0

A study of the governments of England, France, Germany, Italy, and Russia. Mr. Barnhardt.

Pol. Sc. 351. Parties and Pressure Groups in American Policies. 3 or 3 or 3

Prerequisites: For engineering students, Econ. 345; for others, approval of the Department.

A study of the two most prominent types of organization operating on the political scene in present-day America. Attention will be given to the composition, leadership, programs, and methods of major and minor parties and selected pressure groups. Staff.

Courses for Graduates and Advanced Undergraduates

Pol. Sc. 501. Modern Political Theory. 3-0-0

Prerequisite: Consent of the instructor.

A study of the state and its relationship to individuals and groups, approached through the reading of selected passages from the works of outstanding political philosophers from the sixteenth century to the present. Mr. Edsall.

Pol. Sc. 502. Public Administration. 0-3-0

Prerequisite: Consent of the instructor.

A study of the principles and problems of administration in a democracy, including such matters as organization, personnel, fiscal management, relationship to the legislative and judicial functions, control of administrative agencies and policies, and public relations. Mr. Edsall.

Pol. Sc. 503. International Organization. 0-0-3

Prerequisite: Consent of the instructor.

A study of the evolving machinery and techniques of international organization in the present century with particular emphasis on recent developments. The actual operation of international organization will be illustrated by the study of selected current international problems.

HORTICULTURE

Courses for Undergraduates

Hort. 101. General Horticulture. 3-0 or 3

A course designed to give a general insight into the field of horticulture, including geographic centers of production, importance of the industry, and the elements of culture of fruit, vegetable, and floral crops. Mr. Schmidt.

Hort. 201, 202, 203. Woody Plants. 3-3-3

Distribution, identification, culture and use of ornamental trees, shrubs and vines in landscape planting. Mr. Randall.

Hort. 213. Herbaceous Plants. 0-0-3

Distribution, identification, culture and use of ornamental herbaceous perennial and annual plants in landscape planting. Mr. Randall.

Hort. 301. Plant Propagation. 3-0 or 3
Study of principles, methods and practice in seedage, cuttage, division, budding, grafting, and other methods of propagation. A field trip is required.
Mr. Randall.

Hort. 303. Vegetable Growing. 0-0-3
Soil preparation, fertilization, irrigation, and general culture of vegetable crops. Student gardens are maintained as a part of the laboratory work.
Mr. Schmidt.

Hort. 311. Nursery Practice. 3-0-0
The principles and practices involved in the production, management and marketing of nursery plants. A field trip is required. Mr. Randall.

Hort. 312.* Floral Design and Shop Management. 0-3-0
Principles and practices of flower shop management including the art of floral design. A special laboratory fee is required. Mr. Randall.

Hort. 313.* Commercial Floriculture. 0-0-4
A study of the construction and heating of greenhouses and other plant-growing structures and their management in commercial flower crop production. Mr. Randall.

Hort. 321. Grading, Packing, and Judging Fruit and Vegetable Crops.** 3-0-0
Variety identification, grading, packing, exhibiting, and judging horticultural crops. Grades and standards. Field trips are required.
Messrs. Schmidt, Gardner and Staff.

Hort. 331. Fruit Growing. 3-0-0
Production, harvesting and storage of the major tree fruits, with emphasis on apples and peaches. This course is especially adapted to the needs of students who are not majoring in fruit crops. A field trip is required.
Mr. Schneider.

Hort. 343. Principles of Fruit and Vegetable Processing. 0-0-3
Principles and methods involved in the preservation of horticultural crops; with emphasis placed on canning and freezing. Mr. Jones.

Hort. 402. Ornamental Plants. 0-2-0
The characteristics of ornamental plants used in landscape planting.
Mr. Schmidt.

Hort. 403. Landscape Gardening. 0-0-3
Prerequisite: Hort. 402 or equivalent.
The elementary principles of design and the adaptation, use and maintenance of plant materials in landscape planting as applied to home grounds improvement. Mr. Harris.

Hort. 421. Commerical Fruit Production. 5-0-0
Principles underlying the commercial production of tree fruits. Field trips are required. Mr. Schneider.

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*Offered in 1953-54 and in alternate years.
**Offered 1954-55 and in alternate years.

Hort. 422. Small Fruits Production.** 0-3-0

Principles underlying the commercial production of grapes, strawberries, blueberries, raspberries, dewberries and other small fruits. Mr. Morrow.

Hort. 431, 432, 433. Commercial Vegetable Growing. 3-3-3

Prerequisite: Hort. 303.

A study of commercial vegetable crops involving classification, production, physiology, and nutrition. Field trips are required. Mr. Schmidt.

Hort. 441, 442, 443. Commercial Floriculture. 3-3-3

Prerequisite: Hort. 313.

A study of the commercial production of cut-flower and pot-plant crops in the greenhouse, in other structures and in the field. Field trips are required. Mr. Randall.

Courses for Advanced Undergraduates and Graduates

Hort. 501, 502, 503. Horticultural Problems. Credits by arrangement.

Prerequisite: B average and permission of instructor.

A systematic investigation of some phase of horticulture, each student choosing his own subject of study and pursuing it under the direction of the instructor. The problem may last from 1 to 3 quarters.

Credits will be determined by the nature of the problem, not to exceed a total of 6 hours. Staff.

Hort. 512.* Handling and Storage of Ornamental Plants. 0-3-0

Prerequisite: Bot. 421.

A study of the physiological principles involved in the handling and storage of ornamental plants. Staff.

Hort. 521, 522, 523. Technology of Fruit and Vegetable Products. 4-4-4

Prerequisite: Bot. 412.

Comprehensive treatment of principles and methods of preservation of fruits and vegetables including small scale plant operation and commercial processing plant visitations. Inspection, grading, and judging of processed fruits and vegetables. Field trips are required. Mr. Jones.

Hort. 532.* Advanced Commercial Fruit Production. 0-3-0

Prerequisites: Hort. 421 and Bot. 421.

A thorough study of specific phases of fruit production. Mr. Schneider.

Hort. 542. Breeding of Horticultural Plants. 0-3-0

Prerequisite: Gen. 411.

The application of genetics and plant breeding to the improvement of horticultural crops. Mr. Barham.

Hort. 562.* Handling and Storage of Fruits and Vegetables. 0-3-0

Prerequisite: Bot. 421.

A study of the physiological and chemical changes which occur as a result of handling and storage of fruit and vegetable crops. Mr. McCombs.

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*Offered in 1953-54 and in alternate years.

**Offered 1954-55 and in alternate years.

Courses for Graduates Only

Hort. 601. Advanced Vegetable Crops.** 3-0-0

A study of current literature dealing with cultural, physiological and biochemical problems in vegetable crops.

Mr. Cochran and Staff.

Hort. 602. Advanced Ornamental Crops.** 0-3-0

The application of research to the production of the major ornamental crops. Staff.

Hort. 603.* Advanced Pomology. 0-0-3

A critical study of specific problems in fruit production including pertinent current literature. Mr. Schneider and Staff.

Hort. 611.* Methods and Evaluation of Horticultural Research. 4-0-0

A study of methods and procedure, outlining problems, assembling and analyzing data, and presenting results; critical review of research work.

Mr. Morrow and Staff.

Hort. 612. Advanced Fruit and Vegetable Processing.** 0-3-0

A critical study of certain processing methods as applied to fruit and vegetable preservation. Mr. Jones.

Hort. 621. Research. Credits by arrangement.

Graduate students will be required to select problems for original research in ornamental, fruit or vegetable crops, or in food processing. The work and presentation of results should be of such merit as to be worthy of publication.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

Hort. 631. Seminar. Credits by arrangement.

Assignment of scientific articles of interest for review and discussion.

A maximum of three credits is allowed toward the Master's degree but any number toward the Doctorate. Mr. Gardner.

INDUSTRIAL ARTS
AND
INDUSTRIAL EDUCATION

I. A. 103, 104, 105. Industrial Arts Drawing. 3-3-3

Practice in lettering, sketching and the use of instruments as applied to orthographic representation, pictorial drawing, sheet metal drawing, machine drawing, charts and graphs and architectural drawing. A study of planning procedures including working drawings, specifications, bills of materials for various areas of industrial arts. Mr. Troxler.

I. A. 106. Orientation in Industrial Arts. 3-0-0

An orientation course designed to provide industrial arts experiences through the use of tools, materials and processes in woods, metals, electricity, ceramics, graphic arts, textiles and crafts. Some emphasis will also be placed on the organization, methods and procedures used in developing general shops in the public schools. Mr. Schmitt.

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*Offered in 1953-54 and in alternate years.

**Offered 1954-55 and in alternate years.

I. A. 107, 108. General Woodwork. 0-3-3

Courses involving project planning, use and care of common hand tools and woodworking machines, involving basic operations in each; wood finishing; characteristics and uses of common woods; types and uses of hardware and fasteners used in woodwork. Mr. Troxler.

I. A. 205. Industrial Arts Design. 0-3-0

Prerequisites: I. A. 103, 104, 105.

Design and construction in a variety of industrial materials; stressing individual expression and appreciation of well designed industrial products. Mr. Hostetler.

I. A. 206, 207, 208. General Metalwork. 3-3-3

Basic operations and experiences in sheet metal, art metal, bench metal, foundry, machine shop practice, forging, arc and acetylene welding; a study of metals including their properties and uses. Mr. Schmitt.

I. A. 215. Sheet Metal. 0-1-0

Prerequisite: M. E. 271.

A course designed to give students in the Heating and Air Conditioning curriculum of the Mechanical Engineering Department experiences in sheet metal processes, tools, operations, machines, and materials pertaining to duct work. Mr. Troxler.

I. A. 230. Home Mechanics. 3-0-0

A course designed to provide information and experiences with tools, materials, and processes essential in the care, maintenance, and repair of a home and home equipment. Emphasis will be placed on the development of "handy-man" abilities. Staff.

I. A. 270. Problems in Woodworking. 3-0-0

Prerequisites: I. A. 106, 107, 108.

A practical course designed to acquaint students with modern technological developments in the woodworking industry. Emphasis will be given to new tools, materials and processes in wood. Staff.

I. A. 306. Graphic Arts. 3-0-0

A course designed to give the student experiences in the basic operations and provide related information in the areas of letterpress printing, block printing, silk screen printing, bookbinding and etching. Mr. Schmitt.

I. A. 307, 308. General Electricity. 0-3-3

Emphasis during the first course is placed on fundamentals of electricity in which the student constructs projects and performs experiments. The second course deals primarily with radio communication and electronic problems. Assigned reading and reports are required in each course. Mr. Schmitt.

I. A. 314. Recreational Arts and Crafts. 0-0-3

Required of juniors in Industrial and Rural Recreation; elective for others.

A course designed to give students interested in recreation work an understanding of and experiences in different types of arts and crafts adaptable to different age levels. Emphasis will be given to a wide variety of crafts. Professional problems related to crafts will be studied.

Mr. Troxler.

I. A. 315. General Ceramics 3 or 3 or 3

This course is designed to give the students the opportunity to work with ceramic materials as a medium of expression and to get experience in the basic manufacturing processes of the ceramic industry. Emphasis will be given to a study of the sources of clay, designing, forming, decorating and firing of ceramic products. Staff.

I. A. 321. Metalwork Technology 3 or 3 or 3

This course is designed to give the student additional theory and skills in metalworking operations and processes. Emphasis will be on the metal lathe, metal shaper and milling machine. Staff.

I. A. 420. Tools and Materials. 3 or 3 or 3

A study of the development, care and maintenance of hand and machine tools; and of the sources, manufacture, characteristics, uses, and costs of industrial materials and products. Mr. Schmitt.

Ed. 422. Methods of Teaching Industrial Subjects. 0-0-3

Prerequisites: Ed. 344, Psychol. 304.

A study of the principles and methods of teaching manipulative skills and related technology; organization of subject matter, lesson planning and student appraisal. Staff.

Ed. 433. Field Work in Secondary Education. 0-3-0

Prerequisites: Ed. 344 and permission of instructor.

A study of pupil-teacher-community relationships at the secondary school level involving observations, visits, reports, readings and conferences.

Staff.

Ed. 440. Vocational Education. 3 or 3 or 3

Prerequisites: Ed. 344, Psychol. 304.

A comprehensive study of the types of vocational education of less than college grade, provided for through Federal legislation; an evaluation of the effectiveness of the program; and a detailed study of the North Carolina Plan. Staff.

Ed. 444. Student Teaching in Industrial Subjects. 15 or 15 or 15

Prerequisites: Ed. 422, 433.

Observation of and active participation in full time, off-campus student teaching in the public schools for a full term under supervision. Staff.

I. A. 460. The General Shop. 0-3-0

Prerequisite: Senior standing or permission of instructor.

The student is given actual participation in the organization, management, teaching problems, selection, planning and construction of projects on a general shop or laboratory of industries basis. Mr. Hostetler.

Courses for Graduates and Advanced Undergraduates

Ed. 516. Community Occupational Surveys. 0-3-0

Prerequisites: six credits in Education and consent of instructor.

Methods in organizing and conducting local surveys and evaluation of findings in planning a program of vocational education. Staff.

Ed. 521. Organization of Related Study Materials. 3 credits

Prerequisite: Ed. 422 or consent of instructor.

The principles of selecting and organizing both technical and general related instructional material for trade extension and diversified occupations classes. Staff.

Ed. 525. Trade Analysis and Course Construction. 3 or 3 or 3

Prerequisites: Ed. 344, Psychol. 304.

Principles and practices in analyzing occupations for the purpose of determining teaching content. Practice in the principles underlying industrial course organization based on occupational analysis covering instruction in skills and technology and including course outlines, job sequences, the development of instructional materials and instructional schedules. Staff.

Ed. 527. Philosophy of Industrial Education. 0-3-0

Prerequisites: Ed. 344, Psychol. 304.

A presentation of the historical development of industrial education; the philosophy of vocational education; study of Federal and State legislation pertaining to vocational education; types of programs, trends and problems. Staff.

Ed. 528. Principles and Practices in Diversified Occupations. 3 credits

Prerequisite. Ed. 422 or consent of instructor.

A study of the development, the objectives, and principles of diversified occupations. The organization, promotion and management of programs in this area of vocational education. Staff.

Ed. 552. Industrial Arts in the Elementary School. 3 or 3 or 3

(See description on page 236.)

I. A. 570. Laboratory Problems in Industrial Arts Maximum 9 credits

Prerequisites: Senior standing and permission of instructor.

Courses based on individual problems and designed to give advanced majors in industrial arts education the opportunity to broaden or intensify their knowledge and abilities through investigation and research in the various fields of industrial arts, such as metals, plastics, or ceramics. Staff.

I. A. 575. Special Problems in Industrial Arts. Maximum 9 credits

Prerequisite: One term of student teaching or equivalent.

The purpose of these courses is to broaden the subject matter experiences in the areas of industrial arts. Problems involving experimentation, investigation and research in one or more industrial arts areas will be required. Staff.

Ed. 580. Modern Industries. 3 or 3 or 3

Prerequisites: 12 credits in Education and consent of the instructor.

Elective course for advanced undergraduate and graduate students in industrial arts. Designed to assist teachers in guiding students to sources of information relative to various modern industries. Mr. Hostetler.

Ed. 582. Curriculum Problems in Industrial Arts. 3-0-0

Prerequisites: Psychol. 304 and 6 credits in Education.

Planning and organization of learning experiences in the industrial arts area. Mr. Hostetler.

Ed. 583. Instructional Aids and Devices. 0-3-0

Prerequisites: Psychol. 304 and 6 credits in Education.

Analysis of learning units, and the preparation of instructional aids and devices. Mr. Hostetler.

Ed. 584. School Shop Planning and Equipment Selection. 0-0-3

A course for advanced undergraduate and graduate students.

The physical planning of school shops and laboratories; selection of tools and equipment. Whenever possible, actual or contemplated school buildings will be used for class work. Mr. Hostetler.

Ed. 592. Individual Problems in Education. 3 or 3 or 3

An elective course for graduate students in Industrial Arts Education and Industrial Education, with consent of instructor.

Individual and group studies of one or more major problems in industrial arts and industrial education. Problems will be approached through the application of research techniques with final reports prepared in a form suitable for publication as a magazine article, technical or professional bulletin. Mr. Hostetler.

Ed. 595. Industrial Arts Workshop. 3 credits

A course for experienced teachers, administrators and supervisors of industrial arts. The primary purpose will be to develop sound principles and practices for initiating, conducting and evaluating programs in this field. Enrollees will pool their knowledge and practical experiences and will do intensive research work on individual and group problems. Mr. Hostetler.

Courses for Graduates Only

Ed. 610. Administration and Supervision of Vocational Education. 3 or 3 or 3

Prerequisites: Psychol. 304, Ed. 344, 440, 520, or equivalent.

Administrative and supervisory problems of vocational education; practices and policies of Federal and State offices; organization and administration of city and consolidated systems. Staff.

Ed. 614. Modern Principles and Practices in Secondary Education. 3 or 3 or 3

Required of graduate students in Guidance, Industrial Arts and Industrial Education.

Foundations of modern programs of secondary education; purposes, curriculum, organization, administration, and the place and importance of the high school in the community in relation to contemporary social force.

Staff.

Ed. 624. Research in Industrial Arts Education. Maximum 9 credits

Prerequisites: 18 credits in Education and permission of instructor.

The student will be guided in the selection of one or more research problems and in the organization of the problems, methods of gathering data, procedure for analyzing data, and best practice for interpreting and reporting data. Mr. Hostetler.

Ed. 627. Research in Industrial Education. Maximum 9 credits

Prerequisites: 18 credits in Education and permission of instructor.

The student will be guided in the selection of one or more research problems and in the organization of the problems, methods of gathering data, procedure for analyzing data, and best practice for interpreting and reporting data. Staff.

Ed. 630. Philosophy of Industrial Arts. 3 or 3 or 3

Required of all graduate students in Industrial Arts Education.

Current and historical developments in industrial arts; philosophical concepts, functions, scope, criteria for the selection and evaluation of learning experiences, laboratory organization, student personnel programs, community relationships, teacher qualifications, and problems confronting the industrial arts profession. **Mr. Hostetler.**

Ed. 635. Administration and Supervision of Industrial Arts. 3 or 3 or 3

A study of the problems and techniques of administration and supervision in the improvement of industrial arts in the public schools. Selection of teachers and their improvement in service and methods of evaluating industrial arts programs. Mr. Hostetler.

INDUSTRIAL ENGINEERING

Courses for Undergraduates

I. E. 114. Pattern Making Laboratory. 1 or 1 or 1

Required of sophomores in I. E. and M. E.

Elementary joinery, finishing, theory of dry-kilning, wood-turning; lectures, demonstrations, and practice in hand work and machine methods; typical patterns and core boxes constructed, such as solid, split, and loose piece. Messrs. Cope, Maddison.

I. E. 115. Foundry Laboratory. 1 or 1 or 1

Required of sophomores in I. E. and M. E.

Lectures, demonstrations, and practice in molding and core making, cu-

pola operations; melting and casting of ferrous and non-ferrous metals and their alloys; instruction and practice in the testing of molding sands.
Mr. Maddison.

I. E. 116. Welding Laboratory. 1 or 1 or 1
Required of sophomores in Ae. E., I. E., and M. E.
The equipment for gas and electric welding; safety in welding; gases and materials used; types of joints and design for welding; weldability of metals; weld testing. Practice in oxy-acetylene and electric arc welding.
Mr. Cope.

I. E. 169. Welding and Pipe Shopwork. 0-1-0
Required of sophomores in Heating and Air Conditioning.
Fundamentals of welding, both arc and gas, cutting equipment; safety in the use of equipment; application of low temperature and non-ferrous alloys; cutting, threading, reaming and erection of iron pipe; copper tubes and fittings in heating and air conditioning work. Mr. Cope.

I. E. 204. Survey of Engineering and Industrial Processes. 0-3-0
Prerequisite: Econ. 201.
Job-shop and mass production methods, including uses of jigs and fixtures; general descriptive features, uses, and safety features of machine tools: brief outline of time and motion techniques as applied to large-scale manufacturing operations. Staff.

I. E. 206, 207. Industrial Organization and Management. 3-3-0, and 0-3-3
Prerequisite: Sophomore standing.
Organization types, advantages and disadvantages for industrial enterprise; principles of organization structure for internal control; introduction to industrial management principles; selected problems illustrating various management functions. Staff.

I. E. 210. Safety Engineering. 3 or 3 or 3
Prerequisite: Junior standing.
A course in the causes and prevention of industrial accidents.
Mr. Reed.

I. E. 222. Furniture Design and Construction. 0-3-0
Required of sophomores in Furniture Manufacturing and Management.
An introduction to furniture drawing and furniture construction. Furniture styles and periods are briefly covered by lectures and illustrations. Original detail drawings are made by the students from artists' sketches and general specifications. From these, students are required to make up complete bills of materials. Mr. Johnson.

I. E. 224, 225. Wood Working Equipment. 0-3-3
Prerequisite: I. E. 222.
Required of sophomores in Furniture Manufacturing and Management.
Classwork covers the description of cutting, sanding and assembly equipment and an explanation of the type of operation done by each kind of equipment. The theory of cutting and sanding and cutterhead and saw design

are covered. Laboratory work consists of setting up, operating and maintaining typical furniture production equipment supplemented by visits to furniture plants. Mr. Johnson.

I. E. 227, 228, 229. Machine Tool Laboratory. 1-1-1

Required of juniors in Ae. E., and M. E., and sophomores in I. E. and Furniture Manufacturing.

Lectures, demonstrations and practice in laying out work, grinding tools, chipping, drilling, tapping, babbitting bearings, and scraping; machine work, including centering, straight and taper turning, chucking, screw cutting, shaper work, planer work, index milling, gear cutting and grinding. Messrs. Wheeler, Reed.

I. E. 230. Saws and Machine Knives. 0-0-1

Required of sophomores in Furniture Manufacturing and Management. Three hours per week of lectures, demonstration and practice in the operation of filing and grinding equipment for woodworking saw blades, bits, knives and cutterheads.

I. E. 241, 242, 243. Oxy-Acetylene and Electric Welding. 1-1-1

Prerequisite: I. E. 116.

A more thorough treatment of welding than given in I. E. 116 with special emphasis on the economics, design and metallurgy of welding. Mr. Cope.

I. E. 301. Engineering Economy. 0-0-3

Prerequisite: Junior standing.

Required of Juniors in I. E.

A study of principles in which the solutions to engineering problems are translated into economic solutions involving the time value of money. Mr. Henderson.

I. E. 326. Furniture Manufacture and Processing. 0-0-4

Prerequisite: I. E. 224.

Required of juniors in Furniture Manufacturing and Management.

A study of the production methods of the Furniture Industry. The class work includes the production procedures from the yard through the machine, cabinet, finishing, upholstering, and shipping departments. The laboratory period is supplemented by visits to furniture plants. Particular attention is paid to production rates by departments, based on number of men and supervisors, the quality of product produced and equipment used. Mr. Johnson.

I. E. 327. Furniture Marketing. 0-0-3

Prerequisite: I. E. 326.

Study of basic factors bearing on selection of ideal location, equipment and organization to serve a specific market with a specific furniture product, and selection of ideal market and product for a specific factory. In addition to lectures, each student will select one project for which he will work out a solution for correlating product and market. Mr. Willard.

I. E. 328. Manufacturing Processes. 3-0-0

Corequisite: I.E. 229.

Required of sophomores in I. E.

Study of production methods; description and evaluation of machine tools, jigs, and fixtures in modern production; gages and special tools.

Mr. Furlong.

I. E. 332. Motion and Time Study. 4-0-0

Prerequisite: Junior standing.

Required of juniors in I. E. and Furniture Manufacturing and Management.

Principles and techniques in time and motion study; stopwatch and micro-motion analysis of industrial operations; work simplification and development of production standards; applications in procedures analysis. Laboratory period. Mr. Llewellyn.

I. E. 341. Furniture Plant Layout and Design. 4-0-0

Prerequisite: I. E. 326.

Required of juniors in Furniture Manufacturing and Management.

Problems in industrial plant design with special reference to furniture manufacture; building structures, equipment location, space utilization, layout for operation and control; allied topics in power utilization, dust collection, light, heat, ventilation and safety. Laboratory problems include visits to furniture plants and drawing of layouts. Mr. Johnson.

I. E. 343. Plant Layout and Design. 0-4-0

Prerequisite: I. E. 328.

Required of juniors in I. E.

Problems in industrial plant design; building structures, equipment location, space utilization, layout for operation and control; allied topics in power utilization, light, heat, ventilation, and safety. Laboratory period.

Messrs. Llewellyn, Reed.

I. E. 346. Furniture Design and Construction II. 0-3-0

Prerequisite: I. E. 326.

Lecture and laboratory work on the design and construction of modern and period furniture. The course emphasizes construction features that are economical of labor and materials and are adaptable to mass production. Students are required to complete an original design and detailed drawing of a piece of furniture as one requirement of the course.

Mr. Johnson.

I. E. 408. Production Control. 0-0-4

Prerequisite: I. E. 332.

Required of juniors in I. E. and seniors in Furniture Manufacturing and Management.

Planning, scheduling, routing, and dispatching in manufacturing operations; production control systems; mechanisms for production control. Class projects will include organization of a complete production control system starting with a parts analysis from the working drawings of a production item. Mr. Llewellyn.

I. E. 423. Job Evaluation. 3-0-0

Prerequisite: Senior standing.

Required of seniors in I. E. and Furn. Mfg. and Mgt.

Theory and practice of determining the relative money value of jobs within an organization and in localities; job analysis, classification and specification, ranking and grading systems, point systems, building the rate structure, application of merit rating. Factors pertaining to worker and union cooperation. Mr. Furlong.

I. E. 425. Sales and Distribution Methods. 0-3-0

Prequisite: Senior Standing.

An analysis of the fundamental problems of distribution including application of engineering principles to problems; development and marketing of products; merchandising the product; and establishment of sales training programs.

I. E. 433. Wage Administration. 0-3-0

Prerequisite: Senior standing.

Required of seniors in I. E. and Furn. Mfg. and Mgt.

Scientific design, installation, and operation of extra financial incentive plans; analysis and comparison of different types of plans bringing out the characteristics which determine suitability for specific types of operations. Consideration of technique, methods, and administration of wage and salary structures. Mr. Furlong.

I. E. 443. Quality Control. 0-0-3

Prerequisite: Stat. 361 and Senior standing.

Required of seniors in I. E. and Furn. Mfg. and Mgt.

Economic balance between cost of quality and value of quality, and techniques of accomplishing this balance; organization for quality, specification of quality, measurement, acceptance attributes, probability theory and statistical analysis as applied to sampling, control charts, tolerance determination, and acceptance procedures, and control of production.

Messrs. Furlong, Henderson.

I. E. 451, 452, 453. Seminar. 1-1-1

Prerequisite: Senior standing.

Required of seniors in I. E. and Furn. Mfg. and Mgt.

Current problems of interest to industrial engineers. Staff.

Courses for Graduates

I. E. 515. Process Engineering. 3-0-0

Prerequisites: I.E. 328, I. E. 343, I. E. 443.

Application of industrial engineering planning functions to the selection, layout, tooling and methods, standards, cost and control features of proposed products. Development of selected problem in laboratories.

I. E. 535. Material Handling. 0-0-3
Prerequisite: I. E. 408.

Principles, equipment and evaluation of material handling in industry. Shipping, receiving and warehousing. Plant surveys and organization for materials handling.

I. E. 541, 542. Advanced Motion and Time Study. 3-3-0
Prerequisite: I. E. 332.

An advanced investigation of methods of determining time standards. Study of motion-time data and their use in setting standards. Theory and practice in determining allowances. Project work with comparative methods of setting standards for typical manufacturing operations. Detailed study of methods to increase productivity by analysis of operator movements.

I. E. 551, 552. Standard Cost and Budgeting. 0-3-3
Prerequisites: I. E. 301, 332.

Application of engineering methods to establishment of standard cost systems and budgets. Laboratory work with controlled shop conditions.

I. E. 581, 582, 583. Project Work. 2-2-2
Prerequisite: Graduate standing.

Research and investigation for students enrolled in the fifth-year curriculum in Industrial Engineering.

I. E. 635, 636. Planning for Production 3-3-0
Prerequisite: I. E. 408.

A study of the factors to be considered in developing an efficient and realistic plan of production for a manufacturing company. Analysis of sales demands. Market trends and business conditions. Construction of long range production schedules and finished goods inventory controls. Planning for material purchasing, equipment acquisition and labor requirements. Economic and cost factors of inventory turnover rates and control of inventories.

I. E. 671, 672, 673. Seminar. 1-1-1
Prerequisite: Graduate Standing.
Advanced problems in Industrial Engineering.

I. E. 691. Industrial Engineering Research. 3 to 9

INDUSTRIAL AND RURAL RECREATION

Courses for Undergraduates

Rec. 101. Introduction to Physical Education. 3-0-0

Required of freshmen in Industrial and Rural Recreation; elective for others.

Introduces the students to the program of physical education; its definition, aim, and objectives; its scientific foundations; and its activities. The significant problems of an organized program of physical activities relative to industrial and rural recreation are studied. The professional outlook of the physical educator in recreation is presented. Mr. Miller.

Rec. 102. Gymnastics and Stunts. 0-0-3

Required of freshmen in Industrial and Rural Recreation; elective for others.

This course stresses the learning of skills; the selection of activities and appropriate methods of instruction; the techniques and skills for teaching of apparatus, fundamental gymnastics, marching, stunts, and tumbling.

Mr. Crawford.

Rec. 103. Leadership in Recreation. 0-3-0

Required of freshmen in Industrial and Rural Recreation; elective for others.

This course presents the modern theoretical interpretations of the constructive value of play by providing a study of the historical background of the present play movement, of the theoretical explanation of play, of the need for play in modern life, and of the organization and administration of organized play. Mr. Miller.

Rec. 201. Games of Low Organization. 0-0-3

Required of sophomores in Industrial and Rural Recreation; elective for others.

This course emphasizes the learning of games, contests, relays which require little or no equipment and are adaptable to the playground, classroom, gymnasium, picnics, parties informal events for all age levels. Methods of presentation and ways of motivation which are best suitable to games of low organization are stressed. Mr. Miller.

Rec. 202. Aquatic Sports. 0-0-3

Required of sophomores in Industrial and Rural Recreation; elective for others.

A laboratory course includes: the history of the techniques and methods of teaching swimming, modern methods of teaching, diving, officiating, games, pageants, the use of small craft, life-saving techniques, principles of water safety, the organization and administration of water safety programs, and the maintenance of the swimming pool and water front.

Staff.

Rec. 203. Individual Corrective Physical Education. 0-0-3

The problems underlying the need for an individual physical education program for handicapped students are discussed. The primary emphasis will be on the organization and administration of the individual physical education program in schools and colleges; the formulation of individual programs of physical education for the most prevalent types of disabilities found in the school population and the techniques necessary for effective accomplishment of the objectives of the program. Mr. Crawford.

Rec. 204. Methods and Materials in Health Education. 0-0-3

A consideration of the most appropriate content and methods which should be in high school health education programs. Sources of materials are stressed. Public relations are studied. Mr. Miller.

Rec. 205. Methods and Materials in Physical Education. 0-0-3

Presents critical studies of methods of instruction and procedures in supervision applicable to physical education. Provides observation in the required-physical-activity-service courses. Mr. Hines.

Rec. 206. Recreation Facilities and Equipment. 0-3-0

Prerequisites: Rec. 103, 302, or equivalent.

Required of juniors in Industrial and Rural Recreation.

This course is to provide instruction relative to the operation of the recreation center and the individual playground. Attention will be applied to the function, layout, equipment, supplies, and maintenance of the recreation center. Activities, leadership, administrative problems, and problems of operation will be studied. The material is designed to assist recreation authorities to develop a satisfactory plan of operation and maintain an effective standard of service. Mr. Hines.

Rec. 301. Principles and Organization of Physical Education. 3-0-0

Prerequisites: Rec. 101, 103, or equivalent.

Required of juniors in Industrial and Rural Recreation.

This course is to include: the nature of physical education especially in relation to overlapping fields such as health education, rural and industrial recreation, and to education in general; a critical analysis of various objectives; a review, with applications to physical education of modern conceptions of education and of modern principles in psychology and physiology; policies in the organization and administration of the physical education program; classification of students, staff, teaching load, time schedule, finance, etc.; administration of the physical education plant. Mr. Miller.

Rec. 302. Introduction to Community and Industrial Recreation. 3-0-0

Prerequisite: Rec. 103 or equivalent.

Required of juniors in Industrial and Rural Recreation.

This course is to serve as introductory to the organized programs of community and industrial recreation. It shall include: a study of the nature, extent, and significance of recreation; leadership; areas and facilities; activities and program planning, operation of areas and facilities; program features and services; and organization and administration problems. Mr. Hines.

Rec. 303. Dual and Singles Games. 3-0-0

Required of juniors in Industrial and Rural Recreation; elective for others.

The course provides for group instruction in the following sports: archery, bowling, golf, handball, tennis, wrestling, table tennis, deck tennis, aerial darts, shuffle board. The course is of laboratory character, and study of the professional problems involved with assigned readings and reports is required. Mr. Crawford.

Rec. 305, 306. Group Games of High Organization. **0-3-3**

Required of juniors in Industrial and Rural Recreation; elective for others.

This course provides group instruction in the following sports: baseball, basketball, football, track and field, soccer, softball, speedball, tag football, and six man football. The course is of laboratory character, and study of the professional problems involved with assigned readings and reports is required. Mr. Crawford.

Rec. 307. Personal and Community Hygiene. 0-3-3

Required of juniors in Industrial and Rural Recreation; elective for others.

This course is planned to present the essential, present-day knowledge of personal and community health. Emphasis is placed upon personal health problems, disease prevention, communicable diseases, public health administration, school hygiene, industrial hygiene, and the control of communicable diseases. Mr. Miller.

Rec. 310. Social Recreation. 0-0-3

Required of juniors in Industrial and Rural Recreation; elective for others.

To present the materials needed for social play for the party, club, playground, camp, church, and the home. The scope shall consist of: dance and party events; council ring events; scouting, woodcraft, picnic, and outing events; and play activities useful in teaching. The course is of laboratory type. Mr. Miller.

Rec. 311. Camp Organization and Leadership. 0-0-3

Required of juniors in Industrial and Rural Recreation; elective for others.

This course surveys the development of organized camping, the educational, health, and recreational objectives of camping, the construction of programs, health and safety, and community planning for camping. The work of the camp counsellor is stressed. Mr. Stott.

Rec. 315. Prevention and Care of Athletic Injuries. 3-0-0

Prerequisites: Zool. 101 and 213 or its equivalent.

This course is designed for students in residence and for individuals in-service. Directors of community centers, boys clubs, coaches of athletic teams, athletic directors, and others are confronted constantly with: (1) the prevention and (2) the care of athletic injuries. The course is of lecture-laboratory technique. Mr. Crawford.

Courses for Advanced Undergraduates

Rec. 401. Principles and Practices of Industrial Recreation. 3-0-0

Required of seniors in Industrial and Rural Recreation; elective for others.

A study of existing programs of industrial recreation, their operation, methods of finance, scope, and problems is emphasized. Relationship of industrial recreation to other programs of recreation is studied.

Mr. Hines.

Rec. 402. Organization and Administration of Recreation Activities. 3-0-0
Prerequisites: Rec. 101, 103, 301, 302, 304
Required of seniors in Industrial and Rural Recreation.

The development of the modern playground movement, principles and practices in recreational-group-work, organization and administration, planning for recreation, and the relation of community planning to other social planning are studied. The relationships of the Federal government, home, school, church, camping, industry, youth-serving agencies, and commercial interests in the total recreation picture are stressed. Mr. Hines.

Rec. 403. Principles of First Aid and Safety. 0-3-0
Required of seniors in Industrial and Rural Recreation; elective for others.

This course stresses first aid and safety education in relation to the home, school, and community. It strongly emphasizes safety principles as applied to activities of the gymnasium, playgrounds, and athletic fields. Laboratory will provide practice in first aid skill. Messrs. Crawford and Stott.

Rec. 404. Principles and Practices of Rural Recreation. 0-0-3
Prerequisite: Rec. 101, 103, 301, 302, 304, 402, or equivalent.
Required of seniors in Industrial and Rural Recreation.

A study of the organization and administration of rural recreation programs and facilities. Emphasis on planning programs of recreational activities for the rural community, the county-wide program, clubs, and organizations. Study of existing programs of rural recreation, their operation, and their problems will receive major attention. Mr. Hines.

Rec. 405. Recreation Dramatics and Music. 0-3-0
Prerequisites: Rec. 304, 310, or equivalent.
Required of seniors in Industrial and Rural Recreation.

This course is designed to develop leaders of recreational dramatics and music for mass meetings, school assemblies, civic clubs, churches, homes, and other places where informal group programs can be enjoyed. It is of laboratory character. Mr. Stott.

Rec. 431. Campcraft. 3-0-0
Prerequisites: Rec. 311 or Equivalent.

This course is entirely of a laboratory nature. It is designed to provide the student with skills, and methods of teaching campcraft and woodcraft.
Mr. Stott.

Rec. 470. Supervised Practice in Recreation. 15 or 15 or 15

This course is intended to provide the prospective recreation director with an opportunity to acquire experience in the skills and techniques involved in the organization and administration of recreation activities in an established program. Each student during his senior year will spend one quarter off-campus in a selected location. The student will have the opportunity to observe the activities and practices of the recreation executive, to organize and conduct activities under supervision, to observe activities and practices of experienced recreation activity leaders, and to observe the maintenance and operation of facilities. Prior to enrollment in this course, the student is expected to have completed the senior field trip consisting of visits to recognized programs of recreation throughout North Carolina. The student will have the opportunity to become familiar with the total recreation program. Mr. Hines.

Rec. 501, 502. Special Problems in Industrial and Rural Recreation 3-3-0 or 0-3-3

Prerequisites: 1. To have completed 30 hours credit in recreation courses or equivalent.

2. To have a "B" average in recreation courses or equivalent.

A survey of specific problems in recreation. Aims to develop critical analysis. Forms a basis for the organization of research projects, for the compilation and organization of material in a functional relationship, and for the foundation of policies. Follows the seminar procedure.

Mr. Hines.

LANDSCAPE ARCHITECTURE

Courses for Advanced Undergraduates

L. A. 301, 302, 303. Landscape Design I, II, III. 4-4-4

Prerequisite: Des. 203.

Required of all third year students in Landscape Architecture.

A series of problems and research studies selected to acquaint the student with the characteristics peculiar to landscape design and to contrast the handling of scale, planning and space organization with that of allied professions. Staff.

L. A. 322, 323. Landscape Construction I, II. 0-3-3

Prerequisite: Des. 222.

Required of all third year students in Landscape Architecture.

The physical elements of landscape design, earthwork and structures. Instruction is given in the preparation of grading plans; the mathematical design of the horizontal and vertical alignment of roads; surface slopes as influenced by considerations of use, runoff and aesthetic effect; preparation of quantity and cost estimates. Solution and presentation is made to conform to standards of professional office practice. Mr. Clarke.

L. A. 401, 402, 403. Landscape Design IV, V, VI. 6-6-6

Prerequisite: L. A. 303.

Required of all fourth year students in Landscape Architecture.

A progression of problems involving simple areas, multiple areas, and building composition is studied by means of plan, model and sketch. Design types include residential properties, playgrounds, city parks, plazas and squares, school grounds, public buildings, gardens and suitable problems involving building groups. Mr. Clarke.

L. A. 421, 422, 423. Landscape Construction III, IV, V. 4-4-4

Prerequisite: L. A. 323.

Required of all fourth year students in Landscape Architecture.

This course advances the technologies of L. A. 323, going on to the solution of intricate grading and drainage problems and the preparation of detailed working drawings of wood and masonry structures. At least one research report on an approved subject is required. Mr. Clarke.

L. A. 441, 442, 443. Planting Design I, II, III. 3-3-3

Prerequisites: Hort. 203, 213; L. A. 303; Des. 313.

Required of all fourth year students in Landscape Architecture.

The appraisal of plants as objects of design and their orderly arrangement for landscape effect. Techniques for recording designs, specifications and cost estimates. Mr. Thurlow.

L. A. 501, 502, 503. Landscape Design VII, VIII, IX. 10-10-10

Prerequisite: L. A. 403.

Required of all fifth year students in Landscape Architecture.

A continuation of Landscape Design emphasizing problems large in scale. Design types include subdivisions, multi-family housing, campus plans, state parks, parkways, airports and community planning. These design problems stress professional office techniques and may include planting design and working drawing. Mr. Clarke.

MATHEMATICS

Courses for Undergraduates

*Math. 101. Algebra for Engineers. **4-0-0**

Required of freshmen in the School of Engineering.

Quadratic equations, the progressions, the binomial theorem, logarithms, the general theory of equations, the solution of higher equations, determinants and partial fractions. **Staff.**

*Math. 102. Trigonometry for Engineers. **0-4-0**

Prerequisite: Math. 101.

Required of freshmen in the School of Engineering.

The trigonometric functions, derivation of formulas, the solution of plane and spherical triangles, with practical applications, slide rule, complex numbers, and hyperbolic functions. **Staff.**

*Math. 103. Analytical Geometry for Engineers. 0-0-6

Prerequisite: Math. 102.

Required of freshmen in the School of Engineering.

Loci of equations, the straight line, circle, parabola, ellipse, hyperbola, the general equation of the second degree, polar coördinates, transcendental curves, parametric equations, coördinates in space, planes and surfaces. **Staff.**

*Math. 111. Algebra. 4-0-0

Fundamentals of algebra, logarithms, slide-rule, simple and fractional equations, graphs and graphical solutions of equations, percentages, ratio and proportion, areas and volumes of common solids, exponents, radicals, imaginary numbers, quadratic equations, simultaneous equations, progressions, the Binomial Theorem, simple and compound interest, elementary statistics. **Staff.**

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* This course will be repeated the following term.

***Math. 112. Trigonometry.** **0-4-0**

Prerequisite: Math. 111.

Trigonometric functions of acute angles, solutions of right triangles, solutions of general triangles, use of trigonometric tables and of the slide-rule, and logarithms in solving triangles. **Staff.**

***Math. 113. Mathematics of Finance.** **0-0-4**

Prerequisite: Math. 112.

Simple and compound interest, annuities, sinking funds and amortization, and the valuation of bonds and other applications. Staff.

***Math. 123. Analytical Geometry.** 0-0-4

Prerequisite: Math. 112.

Loci of equations, the straight line, circle, parabola, ellipse, hyperbola, the general equation of the second degree, polar coordinates, transcendental curves, parametric equations. In the sequence of courses Math. 111, 112, 123, applications of three dimensional geometry are included. Staff.

***Math. 201. Calculus I.** **4-0-0**

Prerequisite: Math. 103.

Required of sophomores in the School of Engineering.

A course in the fundamental principles of the calculus, including the formulas for differentiation, and for integration of polynomial functions, with applications to geometry and to problems in rates, maxima and minima, curve tracing, curvature, areas, volumes, work pressure, velocity and acceleration. **Staff.**

***Math. 202. Calculus II.** **0-4-0**

Prerequisite: Math. 201.

Required of sophomores in the School of Engineering.

A continuation of Calculus I. Methods of integration, and the study of the definite integral, with applications to problems in areas, volumes, lengths of arcs, surfaces, centroids, moments of inertia, radii of gyration, approximate integration. **Staff.**

Math. 211. Calculus A. **3-0-0**

Prerequisite: Math. 123 or 103.

A course in the fundamentals of the calculus, including formulas for differentiation and for integration of polynomial functions, with applications to geometry and to problems in rates, maxima and minima, areas and volumes. Staff.

Math. 212. Calculus B. **0-3-0**

Prerequisite: Math. 211 or 201.

A continuation of Calculus A. Methods of formal integration, with a study of the definite integral and applications to first and second moments, areas, centroids; approximate integration. Staff.

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* This course will be repeated the following term.

***Math. 303. Calculus III.** **0-0-4**
Prerequisite: Math. 202.
Required of sophomores in the School of Engineering.
A continuation of Calculus II. Indeterminate forms, infinite series, expansion of functions, hyperbolic functions, partial differentiation, double and triple integrals, and differential equations. **Staff.**

Math. 313. Calculus C. **0-0-3**
Prerequisite: Math. 212 or 202.
Elective for sophomores in Textile Chemistry and Dyeing.
A continuation of Calculus B. Indeterminate forms, partial differentiation, double and triple integrals, applications. Staff.

Math. 401. Differential Equations. 3-0-0
Prerequisite: Math. 303.
Required of juniors in Electrical Engineering and elective for others.
Solution of standard types of equations; numerous examples in the field of Electrical Engineering. **Staff.**

Math. 402. Theory of Equations. 0-3-0
Prerequisite: Math. 303.
Elective.
The usual topics in the theory of equations, the solution of higher equations, exponential equations, logarithmic equations, and determinants.
Staff.

Courses for Graduates and Advanced Undergraduates

Math. 501. Graphical and Numerical Methods. 3-0 or 3
Prerequisite: Math. 303.
Elective.
Construction of scales to represent functions, including the construction of some special purpose slide rules and networks. Alignment charts; theory of least squares and empirical curve fitting, including periodic functions. The error curve and some of its properties. Numerous examples in the field of engineering will be solved. Staff.

Math. 502. Advanced Numerical Analysis. 0-3-0
Prerequisites: Math. 401, Math. 501.
Newton and Lagrange interpolation formulas, divided differences, subtabulation. Advanced topics in curve fitting. Graphical and numerical methods for solving ordinary and partial differential equations. Staff.

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* This course will be repeated the following term.

Math. 511. Advanced Calculus for Engineers. 3-0-0
Prerequisite: Math. 401.
Elective.
Continuity; Taylor's series with remainder; differentials, partial differentiation; directional derivative; implicit functions; Jacobians; differentiation of integrals; improper integrals; hyperbolic functions; elliptic integrals. Applications to problems in engineering. Staff.

Math. 512. Advanced Calculus for Engineers. 0-3-0
Prerequisite: Math. 511.
Elective.
A continuation of the work in Math. 511. Differentiation of integrals; improper integrals; gamma and beta functions; line integrals, Green's theorem, Stokes theorem; maximum and minimum points on a surface. Applications to problems in engineering. Staff.

Math. 513. Advanced Calculus for Engineers. 0-0-3
Prerequisite: Math. 512.
Elective.
Introduction to the theory of functions of a complex variable, including simple mapping problems, contour integration and residue theory; review of tests for convergence; series solutions of differential equations; expansion of functions in Fourier series. Staff.

Math. 514. Boundary Value Problems. 3-0-0
Prerequisite: Math. 513.
Ordinary homogeneous and non-homogeneous differential equations with boundary values; characteristic functions; applications of Fourier series and other methods to the solution of certain boundary value problems in partial differential equations. Staff.

Math. 521. Advanced Analytic Geometry. 3-0-0
Prerequisite: Math. 303.
The elements of space geometry; quadric surfaces; general equation of the second degree and its reduction to canonical form; translations and rotations in space; elements of higher plane curves and space curves. Staff.

Math. 522. Theory of Probability. 0-3-0
Prerequisite: Math. 401.
Definitions and fundamental relations. Binomial and multinomial distributions, Poisson and normal distributions, probability integral, Mathematical Expectation, Bayes' Theorem. Applications to problems in engineering and statistics. Staff.

Math. 532. Advanced Differential Equations. 0-3-0
Prerequisite. Math. 401.
Solution of circuit problems by impedence methods; hyperbolic functions of complex quantities and applications; series solutions of differential equations; Bessel functions; operational methods of solving differential equations; introduction to solution of partial differential equations and applications. Staff.

Math. 533. History of Mathematics. 0-0-3
Prerequisite: Math. 303.
Elective.

A study will be made of the lives and contributions of certain outstanding mathematicians as representative of eras in the historical development of mathematics. Staff.

Math. 541. Vector Analysis. 3-0 or 3
Prerequisite: Math. 401.
Elective.

The algebra of vectors with various vector products and applications; the calculus of vectors; partial differentiation; integration; applications to engineering problems. Staff.

Math. 542. Advanced Vector Analysis. 0-3-0
Prerequisite: Math. 541.

A continuation of Math. 541. General coordinates, irrotational and solenoidal vectors, harmonic functions, linear vector functions, applications. Staff.

Courses for Graduates Only

Math. 602. Ordinary and Partial Differential Equations. 0-3-0
Prerequisite: Math. 512.

Solution of ordinary differential equations by simple operational methods; partial differential equations; functions arising from solution of differential equations; applications to problems arising in electrical, civil, and mechanical engineering. Mr. Mumford.

Math. 603. Ordinary and Partial Differential Equations. 0-0-3
Prerequisite: Math. 602.

A continuation of the work in Math. 602. Fourier series and solution of problems in vibrations, heat flow, and electricity; reducible and irreducible homogeneous equations; theory of harmonic functions, Poisson's integral, and boundary value problems. Mr. Mumford.

Math. 604. Orthogonal Functions. 0-3-0
Prerequisite: Math. 513 or consent of instructor.

The development of the theory and properties of general orthogonal functions; applications to Fourier, Bessel, Legendre, Hermitian, Laguerre, and Tchebycheff types of orthogonal functions. Methods developed here will be used in the solution of problems from physics and engineering. Mr. Carroll.

Math. 611. Complex Variable Theory and Applications. 3-0-0
Prerequisite: Math. 513.

Elementary functions; analytic functions and Cauchy-Riemann equations; conformal mapping and applications to field theory and flow phenomena; Taylor and Laurent series; contour integration and residue theory. Mr. Bullock.

Math. 613. Advanced Complex Variable Theory and Applications. 0-0-3
Prerequisite: Math. 611.

A continuation of Math. 611. Further development of theory on series, analytic continuation; mapping and the Schwartz-Christoffel transformation; applications to flow problems and other problems in engineering.
Mr. Bullock.

Math. 621. Advanced Geometry. 3-0-0
Prerequisite: Math. 511.

A study of geometry from an advanced standpoint. Foundations of geometry. Geometric transformations. Invariants under transformations. Applications of geometric methods to analyzing singularities. Geometric constructions. Mr. Clarkson.

Math. 622. Advanced Algebra. 0-3-0
Prerequisite: Math. 303.

Determinant and matrix theory; transformations; quadratic forms; characterictic equation. Messrs. Strobel, Nahikian.

Math. 623. Calculus of Finite Differences and Difference Equations. 0-0-3
Prerequisite: Math. 401.

Symbolic methods; generating functions; factorial, gamma, and beta functions; binomial coefficients; methods of summation; the numbers and polynomials of Bernoulli, Boole, Euler, Sterling; interpolation; difference equations. Mr. Carroll.

Math. 632. Operational Mathematics. 0-3-0
Prerequisite: Math. 611.

Fourier integral and applications; Laplace transform and applications to solution of differential equations arising from engineering problems.
Mr. Cell.

Math. 633. Advanced Operational Mathematics. 0-0-3
Prerequisite: Math. 632.

Extended development of the theory of the Laplace transform; further applications to engineering problems. Mr. Cell.

Math. 641. Calculus of Variations and Applications. 3-0-0
Prerequisite: Math. 401.

Necessary and sufficient conditions for existence of an extremum for an integral which is a function of one or several independent variables; specific examples such as the brachstochrone problem; Hamilton's principle and the principle of least action; brief consideration of the isoperimetric problem and the variable end-point problem. Mr. Winton.

Math. 651. Expansion of Functions. 3-0-0
Prerequisites: Math. 611, 632.

Expansion of functions of one or several variables in Taylor series; asymptotic series, infinite products, partial fractions, continued fractions, series of orthogonal functions. Applications in engineering will be included.
Mr. Cell.

Math. 661. Tensor Analysis I. 3-0-0

Prerequisites: Math. 512, 541, 602.

Recommended (but not required) Math. 521, 542, 622.

The basic theory. Tensor algebra, tensor calculus. Invariant theory. Quadratic differential forms, covariant differentiation, curvature tensor. Geometric applications, Riemannian spaces, parallelism, geodesics, normal coordinates. Generalized vector analysis. Mr. Levine.

Math. 662. Tensor Analysis II. 0-3-0

Prerequisite: Math. 661.

Physical applications: (1) Dynamics. Lagrange's equations, generalized coordinates. The geometry of dynamics, kinematic and action line elements. Holonomic and non-holonomic systems. Configuration space. Dynamics in n-dimensions. (2) Elasticity. Finite strains, equations of compatibility, strain invariants, stress tensor, equations of motion, generalized Hooke's law, isotropic stress-strain relations. (3) Hydrodynamics. Perfect fluids, viscous fluids, viscosity tensor. Navier-Poisson-Duhem equations of motion.

Mr. Levine.

Math. 663. Tensor Analysis III. 0-0-3

Prerequisite: Math. 662.

Further physical applications. (1) Electromagnetic theory. Maxwell's equations, plane waves, stress-energy tensor. (2) Relativity. Lorentz transformation, field equations. Schwarzschild solution, planetary orbits, unified field theories. Non-riemannian spaces. Mr. Levine.

Math. 691. Research in Mathematics. 3 to 9

Prerequisite: Graduate standing and approval of adviser.

Individual research in the field of mathematics.

Math. 681, 682, 683. Special Topics in Mathematics. 3-3-3

Prerequisite: Math. 602 or Math. 632.

Elective.

This course provides an opportunity for small groups of graduate students to study, under the direction of qualified members of the professional staff, advanced topics in their special fields of interest.

Graduate Staff.

MATHEMATICS AND SCIENCE EDUCATION

Ed. 470. Methods of Teaching Mathematics. 5-0-0

A study of the purposes, methods, materials and evaluation practices appropriate for teachers of mathematics at the secondary level.

Ed. 471. Student Teaching in Mathematics. 0-15-0

This course is intended to provide the prospective teacher with an opportunity to get experience in the skills and techniques involved in teaching mathematics. Each student during the senior year will spend one quarter off-campus in a selected center. In addition to acquiring the necessary competencies for teaching mathematics, the student teacher will also have an opportunity to become familiar with the total school program and to participate in as many community activities as time will permit during the period of student teaching.

Ed. 475. Methods of Teaching Science. 5-0-0

A study of the purposes, methods, materials and evaluation practices appropriate for teachers of physical and natural science at the secondary level.

Ed. 476. Student Teaching in Science. 0-15-0

This course is intended to provide the prospective teacher with an opportunity to get experience in the skills and techniques involved in teaching science. Each student during the senior year will spend one quarter off-campus in a selected center. In addition to acquiring the necessary competencies for teaching science, the student teacher will also have an opportunity to become familiar with the total school program and to participate in as many community activities as time will permit during the period of student teaching.

MECHANICAL ENGINEERING

Courses for Undergraduates

M. E. 101, 102, 103. Engineering Drawing. 2-2-2

Required of freshmen in Engineering, Agricultural Engineering, and Textiles; sophomores in Forestry—Wood Technology and Lumber Products Merchandising, Wildlife Conservation and Management.

Lettering; instrument practice; geometrical construction; projections; technical sketching, sections; auxiliary projections; revolution; pictorial drawing; fasteners; intersection and development; working drawings; charts and graphs; tracing and blueprinting, and other reproductions.

M. E. 184. Elements of Heating and Air Conditioning. 0-0-3

Required of third year students in Architecture.

Prerequisite: Junior standing.

A study of the factors effecting heat losses and gains in buildings; various types of heating systems including boilers and furnaces; elementary theory of air-conditioning and applications.

M. E. 201. Descriptive Geometry. 2 or 2 or 2

Prerequisite: M. E. 103.

This course should not be taken concurrently with M. E. 202.

Required of sophomores in Ae. E., Ag. E., C. E., and M. E.

Representation of geometrical magnitudes with points, lines, planes and solids; concurrent noncoplanar forces; the solution of problems.

M. E. 202. Machine Drawing. 2 or 2 or 2

Prerequisite: M. E. 103.

This course should not be taken concurrently with M. E. 201.

Required of sophomores in Ae. E., M. E., juniors in Ag. E.

Advanced problems in Applied Descriptive Geometry; piping drawings and valves, technical sketching; welding; aircraft and structural drawings;

redesign problems; jigs and fixtures; charts and graphs; use of engineering tables; gears and cams; working drawings with tracing and blueprinting.

M. E. 271, 272. Mechanical Drawing. 2-2-0
Prerequisite: M. E. 103.
Required of sophomores in Heating and Air Conditioning.
Drawing board work on heating symbols; advanced intersection and development; sheet metal drawing, duct layout; compressor and condenser layout; use of catalog data and tables as applied to drafting practices; tracings and reproductions of drawings.

M. E. 273. Piping Drawing. 0-0-2
Prerequisite: M. E. 272.
Required of sophomores in Heating and Air Conditioning.
Drawing board work on steam piping (single line, double line, isometric, and other pictorials); hot water and other piping, valves, traps, filters, and miscellaneous equipment, boiler hookups and connections; details of auxiliary equipment.

M. E. 307, 308, 309. Engineering Thermodynamics. 3-3-3
Prerequisites: Phys. 203, Math. 202.
Required of juniors in Ae.E., Cer.E., E.E., I.E., M.E., seniors in C.E., Geol. Eng.
Fundamental laws of energy transformations; behavior of gases, vapors and mixtures; combustion; applications to compressors, steam turbines, refrigeration, air conditioning, internal combustion engines and gas turbines.

M. E. 313, 314, 315. Mechanical Engineering Laboratory I. 1-1-1
Concurrent with M. E. 307, 308, 309.
Required of juniors in Ae.E., E.E., I.E., M.E., seniors in Geol. Eng.
Instrumentation as applied to pressure, temperature, speed and power measurements; determination of properties of fuels and lubricants; determinations of characteristics of nozzles, pumps, compressors, steam engines and steam turbines.

M. E. 317, 318, 319. Kinematics. 3-3-3
Prerequisites: E.M. 312 and M.E. 202.
Required of juniors in M.E.
A study of the motions of machine parts, with emphasis on graphical methods; covering linkages, cams; gears, etc., in relation to displacements, velocities, and accelerations. This work is followed by static and dynamic force analyses of machines.

M. E. 321. Metallurgy. 3-0 or 3
Prerequisites: Phys. 203 or Phys. 213.
Required of juniors in Chem. E.
A general course in physical metallurgy including laboratory work. The constitution, structure and properties of engineering ferrous and non-ferrous metals and alloys; influences of mechanical working and heat treatment; physical testing; corrosion and its prevention.

M. E. 322, 323. Metallurgy. 3-3-0 or 0-3-3

Prerequisites: Phys. 203 or Phys. 213.

Required of juniors in M.E. and Ae.E.

The constitution, structure and properties of engineering ferrous and non-ferrous metals and alloys; influences of mechanical working and heat treatment; physical testing, corrosion and its prevention.

M. E. 327. Mechanisms. 3-0-0

Prerequisite: M. E. 202.

Required of juniors in Ae.E.

A condensed course covering relative motions, velocities, and accelerations of machine parts, including linkages, cams, gears, and other mechanisms.

M. E. 350. Advanced Engineering Drawing. 0-3 or 3

Prerequisite: M. E. 103.

Drawings relating to special problems in various engineering fields. Includes lectures, recitations, and individual conferences.

M. E. 371, 372. Fundamentals of Gases and Vapors. 3-3-0

Prerequisites: Math. 201, Physics 213.

Required of juniors in Heating and Air Conditioning.

Principles of the behavior of those gases, particularly air and air vapor mixtures, steam, and refrigerants, encountered in heating and air conditioning work.

M. E. 373. Fundamentals of Steam Power Plants. 0-0-3

Prerequisite: M. E. 372.

Required of juniors in Heating and Air Conditioning.

Principles of steam power plants with particular emphasis on the generation of steam and the availability of by-product steam for heating purposes.

M. E. 375, 376, 377. Mechanical Laboratory. 1-1-1

Prerequisite or concurrent M. E. 371, 372, 373.

Required of juniors in Heating and Air Conditioning.

The use, limitations and calibrations of instruments for the measurement of temperature, pressure, power and speed; testing fuels and lubricants, pumps, compressors, refrigerating equipment.

M. E. 379. Mechanical Equipment of Buildings. 0-0-3

Prerequisite: M. E. 372.

Required of juniors in Heating and Air Conditioning.

A study of the types of equipment used in various buildings, such as plumbing, elevators, and miscellaneous equipment which affect the design and layout of the heating and air conditioning system.

M. E. 381, 382, 383. Principles of Heating and Air Conditioning. 3-3-3

Prerequisite: M. E. 373; concurrent: M. E. 391, 392.

Required of seniors in Heating and Air Conditioning.

Principles of heating and air conditioning and their applications to the design and operation of heating and air conditioning systems; methods of controls of various component parts of such systems.

M. E. 385, 386, 387. Heating and Air Conditioning Design. **3-3-3**
Prerequisite or Concurrent: M. E. 381, 382, 383.
Required of seniors in Heating and Air Conditioning.
The design, layout and cost estimates of various types of heating and air conditioning systems.

M. E. 391, 392. Principles and Applications of Refrigeration. **3-3-0**
Concurrent: M. E. 381, 382.
Required of seniors in Heating and Air Conditioning.
The fundamental principles of refrigeration, the performance of various types of refrigerating machines and their applications to air conditioning; controls of such systems.

M. E. 393, 394, 395. Heating and Air Conditioning Laboratory. **1-1-1**
Prerequisite: M. E. 377. Concurrent: M. E. 381, 382, 383.
Required of seniors in Heating and Air Conditioning.
The testing of heat transfer equipment including feed water heaters, radiators, convectors, unit heaters, heating panels; heating boilers, hot air furnaces, stokers, oil burners; air conditioners of both the spray and coil types, evaporative condensers.

M. E. 401, 402, 403. Power Plants. **3-3-3**
Prerequisite: M. E. 309.
Required of seniors in Mechanical Engineering.
Fuels and combustion; heat balance, steam boilers, prime movers, and auxiliaries, as applied to power generation.

M. E. 407, 408, 409. Mechanical Engineering Laboratory II. **1-1-1**
Prerequisites: For M. E. 407: M. E. 315; for M. E. 409: M. E. 323.
Required of seniors in Mechanical Engineering.
Advanced study and tests in the fields of power plants, heating and ventilation, metallurgy, fluid flow, compressed air, fuels and combustion, and lubrication.

M. E. 411, 412, 413. Machine Design. **3-3-3**
Prerequisites: For M.E. 411: M.E. 319, E.M. 321; for M.E. 412: E.M. 422, M.E. 411.
Required of seniors in Mechanical Engineering.
A study of the methods of designing machine elements to withstand steady and varying forces and to operate without excessive wear at friction areas. Elementary stress analysis is followed by combined stresses, applied to such elements as screws, tanks, keys, shafts, springs, bearings, belting, clutches, brakes, frames, and gears.

M. E. 461, 462, 463. Experimental Engineering. **3-3-3**
Prerequisites: M. E. 315 or equivalent as approved by instructor.
Advanced engineering principles applied to a specific project dealing with heat, power, hydraulic machinery, metallography, aerodynamics, or general experimental work. A seminar period provided. and a written report required.

M. E. 491, 492, 493. Technical Seminar. 1-1-1

Prerequisite: Junior or senior standing.

Elective for juniors or seniors in M. E.

Meetings once a week for the delivery and discussion of student papers on topics of current interest in Mechanical Engineering.

Courses for Graduates and Advanced Undergraduates

M. E. 517. Advanced Kinematics. 0-3-0

Prerequisite: M. E. 319.

A further study of velocity and acceleration of mechanisms. Helical, Spiral Bevel, and Hypoid Gears are analyzed and designed kinematically. Several special mechanisms are also studied.

M. E. 525, 526. Experimental Stress Analysis. 3-3-0

Prerequisites: M. E. 319; E. M. 321.

The study of stress determination in machine elements experimentally by Photoelasticity, Electric and Mechanical Strain Gauges, Brittle Coating and other means. The correlation between photoelastic studies and the endurance limit of materials as applied to design stresses is considered.

M. E. 527. Lubrication. 0-0-3

Prerequisite: M. E. 412.

The comprehensive study of viscosity, viscosimetry, oiliness, friction of perfectly and imperfectly lubricated surfaces. The theory of viscous and boundary lubrication and of bearing design from the standpoint of lubrication are covered.

M. E. 541, 542, 543. Physical Metallurgy. 3-3-3

Prerequisite: M. E. 323.

Theories concerning behavior and control of engineering alloys, reaction rates in the solid state and alloy influences; current heat treating practices; surface treatments; behavior of metals at high and low temperatures; special purpose alloys; powder metallurgy; review of modern equipment and methods for the study of metals.

M. E. 545. Metallurgical Factors in Design. 0-3-0

Prerequisite: M. E. 323.

Study of the metallurgical factors that must be considered in using metals in design.

M. E. 551, 552, 553. Project Work in Mechanical Engineering. 2-2-2

Individual or group assigned design, construction, analytical or experimental projects in Mechanical Engineering.

M. E. 555. Heating and Air-Conditioning. 3-0-0

Prerequisite: M. E. 309.

Principles of heating and ventilation; warm air, steam, and hot-water heating systems; air-conditioning.

M. E. 556. Refrigeration. 0-3-0

Prerequisite: M. E. 309.

An analysis of the simple, compound, centrifugal and multiple effect compression system, the steam jet and the absorption systems of refrigeration.

M. E. 575. Steam Turbines. 3-0-0

Prerequisite: M. E. 309 or M. E. 373.

The application of thermodynamics to steam turbines of both the impulse and reaction types. The flow of the steam is studied in both the nozzles and blades, with particular emphasis on energy transformations.

M. E. 576. Gas Turbines. 0-3-0

Prerequisite: M. E. 309.

The application of thermodynamics to gas turbines. The theoretical cycle is first reviewed and then modifications are made to account for imperfections in the compressor, turbine and combustor. The effects of regeneration and compounding are evaluated.

M. E. 577. Heat Transfer. 0-0-3

Prerequisite: M. E. 308 or M. E. 373.

A study of the various methods of heat transfer both in the steady and unsteady states with applications to building materials, other insulating materials, and to heat exchanging equipment.

Courses for Graduates Only

M. E. 601, 602, 603. Mechanical Engineering Seminar. 1-1-1

Faculty and graduate student discussions centered around current research problems and advanced engineering theories and developments.

M. E. 604. Mechanical Engineering Research. 3 to 9

Prerequisites: M. E. 403, 413.

Research and thesis in connection with M. E. 671, 672, 673; M. E. 681, 682, 683; M. E. 651, 652, 653.

M. E. 611, 612, 613. Advanced Machine Design. 3-3-3

Prerequisite: M. E. 413.

Continued application of the principles of Mechanics and the Strength of Materials to the design of machine elements, culminating in the design of composite machines. Economic considerations are stressed and an effort is made to develop good judgment and a sense of proportion in the student.

M. E. 631, 632, 633. Machinery Laboratory. 1-1-1

Prerequisite: M. E. 413.

Experimental work on various phases of design and machine analyses. The work will consist of experiments in machine stress analysis by several methods, vibrations, and lubrication.

M. E. 635, 636. Mechanics of Machinery. 0-3-3

Prerequisites: M. E. 413, Math. 401.

Advanced study of the Kinematics and Kinetics of Machines, with special emphasis on static and inertia forces. The course includes balancing of machinery, and the complete force analysis of a machine.

M. E. 651, 652, 653. Heating and Air Conditioning Design. 3-3-3

Prerequisites: M. E. 555 or M. E. 383.

The design of heating and air conditioning systems; the preparation of specifications and performance tests on heating and air conditioning equipment.

M. E. 671, 672, 673. Advanced Engineering Thermodynamics. 3-3-3

Prerequisite: M. E. 308.

An intensive study of the fundamental thermodynamic principles and their application to advanced engineering problems.

M. E. 681, 682, 683. Advanced Power Plants. 3-3-3

Prerequisite: M. E. 403.

The selection and design of various pieces of heat-power equipment; the interrelation of equipment in various types of power plants and the effects of this equipment on the performance of the plant as a whole.

AERONAUTICAL OPTION

Courses for Undergraduates

Ae. E. 310. Elements of Aeronautical Engineering. 0-0-3

Prerequisites: E. M. 313, E. M. 321.

Required of juniors in Aero. Option.

Introduction to aircraft, their components and general principles of flight.

Ae. E. 421, 422, 423. Airplane Design. 3-3-3

Prerequisites: E. M. 422; Concurrent with Ae. E. 431, 432, 433.

Required of seniors in Aero. Option.

A study of the design and construction of airplanes. Work in class and drafting room of a complete airplane design project including preliminary layout, detail design, CAA requirements for design, and stress analysis of the structure as required by the Department of Commerce.

Ae. E. 431, 432, 433. Aerodynamics. 3-3-3

Prerequisites: Math. 401, Ae. E. 310, E. M. 430.

Required of seniors in Aero. Option.

A study of engineering aerodynamics, airplane performance, stability and control; including an introduction to transonic and supersonic aerodynamics.

Ae. E. 441, 442, 443. Aeronautical Laboratory. 1-1-1

Prerequisites: M. E. 309 and M. E. 315. Concurrent with Ae. E. 431, 432, 433.

Required of seniors in Aero. Option.

Wind tunnel testing of airplane components, bluff bodies, airfoils, laminar and turbulent flows. Structural testing of modern airplane parts with special emphasis on CAA load test requirements. A study of modern aircraft engines, hydraulic systems, and instrument design.

Courses for Graduates and Advanced Undergraduates

Ae. E. 565. Aircraft Instruments. 3-0-0

Prerequisite: Ae. E. 310.

A study of modern aircraft instruments including power plant, flight and navigation instruments.

Ae. E. 566. Flight Test Techniques. 0-0-3

Prerequisite: Ae. E. 310.

Methods of obtaining aerodynamic data through flight testing, flight test evaluation of airplanes, flight data reduction to standard condition, instrumentation and flight test procedures.

Ae. E. 567. Propeller and Rotary Wing Design. 0-3-0

Prerequisite: Ae. E. 310.

A study of the design of aircraft propellers and rotary wing theory and design. Discussions of problems of performance evaluation, control and stability, as applied to rotating wing aircraft.

Ae. E. 571, 572, 573. Theory and Design of Aircraft Structures. 3-3-3

Required in Fifth-Year Curriculum in Aero. Option.

Prerequisite: E. M. 422.

The study of design methods for structural components subjected to any given combination of loads. Methods of structural analysis of various structural types used for the major structural items of a modern metal airplane. Study includes: truss and frame analysis; problem of instability; analysis of thin wall structures.

Courses for Graduates Only

Ae. E. 631, 632, 633. Advanced Aerodynamics. 3-3-3

Prerequisite: Ae. E. 433.

Required in Fifth-year curriculum in Aero. Option.

Mathematical and theoretical treatment of aerodynamics of non-viscous and viscous fluids. Introduction to conformal transformation and three dimensional flows. Supersonic aerodynamics including critical Mach numbers, shock wave mechanics and supersonic airfoil theory.

Ae. E. 635, 636. Hydrodynamics. 0-3-3

Co-requisites: Ae. E. 632, 633.

Resumé of modern theoretical hydrodynamics and hydraulics in connection with aerodynamics. Emphasis is placed on hydrodynamic design of seaplane hulls and the design and testing of models in the various types of towing tanks. Study of stability problems of seaplane hulls and float combinations.

Ae. E. 664. Aircraft Applied Loads. 3-0-0
Prerequisite: Ae. E. 433.
The study of external loads applied to the airplane, maneuvering and gust loads, spanwise airload distributions for unswept and swept wings, dynamic flight loads.

Ae. E. 665. Flying Qualities. 0-3-0
Prerequisite: Ae. E. 433.
The study of design factors as they affect stick free and stick-fixed and maneuvering stability, lateral controllability and control force determination.

DEPARTMENT OF MILITARY SCIENCE AND TACTICS

(See also "Military Training" in Section II of the catalog)

COURSES OF INSTRUCTION—Students who enroll in Army ROTC are assigned to one of five available courses of instruction each of which pertains to a branch of the Army, except that first year basic subjects are common to all arms and services of the Army. The five branches to which courses pertain are: Infantry, Signal Corps, Quartermaster Corps, Corps of Engineers and Ordnance Corps. The Infantry and Quartermaster Corps courses are open to all students. The Signal Corps, Corps of Engineers and Ordnance Corps courses are open only to those students who are majoring in college engineering courses or who have a background of training which specially fits them for one of these technical branches.

Students may elect the course of instruction in which they desire to be enrolled subject to the above limitations and within quota assignments. Students who enroll in advanced courses normally continue instruction in the branch in which they completed their basic instruction.

Students enrolled in any one course compose an ROTC unit of the college. The unit is referred to by the branch to which instruction pertains as for example "Infantry ROTC Unit"—"Signal Corps ROTC Unit."

THE BASIC COURSE*

Military Science 101, 102, 103. 2-2-2
Military Science I. Instruction is given in Leadership, Drill and Exercise of Command and basic subjects common to all branches.

Military Science 201, 202, 203. 2-2-2
Military Science II (Infantry).
Prerequisite: Military Science I or equivalent credit.
Instruction is given in Leadership, Drill, and Exercise of Command and in basic Infantry subjects.

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* All veterans in service as long as six months are excused from this course.

Military Science 211, 212, 213. 2-2-2
Military Science II (Signal Corps).
Prerequisite: Military Science I or equivalent credit.
Instruction is given in Leadership, Drill, and Exercise of Command and in basic Signal Corps subjects.

Military Science 231, 232, 233. 2-2-2
Military Science II (Corps of Engineers).
Prerequisite: Military Science I or equivalent credit.
Instruction is given in Leadership, Drill, and Exercise of Command and in basic Corps of Engineers subjects.

Military Science 241, 242, 243. 2-2-2
Military Science II (Ordnance Corps).
Prerequisite: Military Science I or equivalent credit.
Instruction is given in Leadership, Drill, and Exercise of Command and in basic Ordnance subjects.

Military Science 251, 252, 253. 2-2-2
Military Science II (Quartermaster Corps).
Prerequisite: Military Science I or equivalent credit.
Instruction is given in Leadership, Drill, and Exercise of Command and in in basic Quartermaster Corps subjects.

THE ADVANCED COURSE

Military Science 301, 302, 303. 3-3-3
Military Science III (Infantry).
Prerequisites. Military Science I and Military Science II (Infantry) (or Veteran credit.)
Instruction is given in Leadership, Drill and Exercise of Command and in advanced Infantry subjects.

Military Science 311, 312, 313. 3-3-3
Military Science III (Signal Corps).
Prerequisites: Military Science I and Military Science II (Signal Corps) (or Veteran credit).
In this course, which is generally limited to students pursuing an Engineering Curriculum, instruction is given in Leadership, Drill, and Exercise of Command and in Advanced Signal Corps subjects.

Military Science 331, 332, 333. 3-3-3
Military Science III (Corps of Engineers).
Prerequisites: Military Science I and Military Science II (Corps of Engineers) (or Veteran credit).
In this course, which is limited to students pursuing an Engineering curriculum, instruction is given in Leadership, Drill, and Exercise of Command and in advanced Corps of Engineering subjects.

Military Science 341, 342, 343. 3-3-3

Military Science III (Ordnance Corps).

Prerequisites: Military Science I and Military Science II (Ordnance Corps) (or Veteran credit).

In this course, which is generally limited to students pursuing an Engineering Curriculum, instruction is given in Leadership, Drill, and Exercise of Command and in advanced Ordnance Corps subjects.

Military Science 351, 352, 353. 3-3-3

Military Science III (Quartermaster Corps).

Prerequisites: Military Science I and Military Science II (Quartermaster Corps) (or Veteran credit).

Instruction is given in Leadership, Drill, and Exercise of Command and in advanced Quartermaster Corps subjects.

Military Science 401, 402, 403. 3-3-3

Military Science IV (Infantry).

Prerequisite: Military Science III (Infantry).

Instruction is given in Leadership, Drill, and Exercise of Command, advanced Infantry subjects and subjects which are common to all arms and services.

Military Science 411, 412, 413. 3-3-3

Military Science IV (Signal Corps).

Prerequisite: Military Science III (Signal Corps).

Instruction is given in Leadership, Drill, and Exercise of Command, advanced Signal Corps subjects, and subjects which are common to all arms and services.

Military Science 431, 432, 433. 3-3-3

Military Science IV (Corps of Engineers).

Prerequisite: Military Science III (Corps of Engineers).

Instruction is given in Ladership, Drill, and Exercise of Command, advanced Corps of Engineers subjects, and subjects which are common to all arms and services.

Military Science 441, 442, 443. 3-3-3

Military Science IV (Ordnance Corps).

Prerequisite: Military Science III (Ordnance Corps).

Instruction is given in Leadership, Drill, and Exercise of Command, advanced Ordnance Corps subjects, and subjects which are common to all arms and services.

Military Science 451, 452, 453. 3-3-3

Military Science IV (Quartermaster Corps).

Prerequisite: Military Science III (Quartermaster Corps).

Instruction is given in Leadership, Drill, and Exercise of Command, advanced Quartermaster Corps subjects, and subjects which are common to all arms and services.

DEPARTMENT OF AIR SCIENCE AND TACTICS

(See also "Military Training" in Section II of the Catalog)

Course of Instruction—The Air Force ROTC offers a generalized course of instruction. The number of students enrolled in the course is subject to quota limitations.

The Basic Course*

Air Science 121, 122, 123. 2-2-2
Air Science I (Common Course).
Instruction is given in Introduction to Aviation, Fundamentals of Global Geography, International Tensions and Security Organizations, and Instruments of National Military Security.

Air Science 221, 222, 223. 2-2-2
Air Science II (Common Course).
Prerequisite: Air Science I or Equivalent Credit.
Instruction is given in Elements of Aerial Warfare, Careers in USAF, and Leadership Laboratory—Cadet Non-commissioned Officers Training.

The Advanced Course

Air Science 321, 322, 323. 3-3-3
Air Science III (Common Course).
Prerequisite: Air Science I and II, Veteran Credit or Equivalent Credit.
Instruction is given in Air Force Commander and Staff, Problem Solving Techniques, Communications Process and Air Force Correspondence, Military Law, Courts and Boards, Applied Air Science Aircraft Engineering, Navigation, Weather, and Air Force Base Functions, and Leadership Laboratory.

Air Science 461, 462, 463. 3-3-3
Air Science IV (Aircraft Maintenance Engineering)
Prerequisite: Air Science III (Aircraft Maintenance Engineering).
Instruction is given in Advanced Aircraft Engineering Subjects and Leadership, Drill and Exercise of Command.

Air Science 471, 472, 473. 3-3-3
Air Science IV (Communications)
Prerequisite: Air Science III (Communications). Instruction is given in advanced Air Force Communications subjects and in Leadership, Drill and Exercise of Command.

Air Science 481, 482, 483. 3-3-3
Air Science IV (Flight Operations)
Prerequisite: Air Science III (Flight Operations)
Instruction is given in courses designed to prepare students to become members of air crew and Leadership, Drill and Exercise of Command.

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* All veterans in service as long as six months are excused from this course.

MODERN LANGUAGES

Language Preparation for Graduate Work.—Undergraduate students who contemplate doing graduate work leading to the degrees of Master of Science and Doctor of Philosophy should begin their language studies as early as possible in their courses. Before registering for language courses, such students should confer with the head of this department.

Translation Service.—A special feature of the work of the Modern Language department is that of the Translation Service. This work is conducted as an aid to research, on the one hand, and a means to the acquisition of a reading knowledge of the respective language, on the other. Through this service advanced undergraduate students and graduate students registered in technical and scientific courses are given the opportunity of working a translation project in connection with their field of major interest. When such project is satisfactorily completed, it is submitted as evidence of reading ability.

Research Co-operation.—In order that this department may co-operate to the fullest extent possible in the research program of the College members of the staff who are engaged in research should make available to the department material which they wish translated in connection with their work. The personnel of the department is equipped to make translations from the following languages: French, German, Spanish, Russian, Italian, Portuguese, Swedish, Norwegian, Danish and Estonian.

FRENCH*

M. L. 101, 102. Elementary French 3-3-0 or 0-3-3

Structure, diction, pronunciation, and other matters of technique of the language, supplemented by easy readings and translations. Individual reports and conferences. No previous training in the language necessary.

Staff.

M. L. 201. French Conversation and Composition. 3 or 3 or 3

Prerequisites: M.L. 101, 102 or equivalent**.

A course for students who wish to attain proficiency in spoken French. Attention given to composition and practice in the use of the spoken language. **Staff.**

M. L. 202. French Prose: Litterature Francaise au 18^e Siecle. 3 or 3 or 3

Prerequisites: M.L. 101, 102 or equivalent**.

Selected readings from literary and historical French up to the 18th century. Attention given to the attainment of skill in reading and comprehension. **Staff.**

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* Courses numbered above M. L. 102 need not be followed as a sequence in their respective gamut.

** Two years of high-school work will be considered the equivalent of M. L. 101, 102.

M. L. 203. French Prose: Litterature Francaise, 18ᵉ et 19ᵉ Siecles. 3 or 3 or 3

Prerequisites: M.L. 101, 102 or equivalent**.

Selected readings from literary and historical French of the 18th and 19th centuries. Attention given to the attainment of skill in reading and comprehension. Staff.

M. L. 301, 302. Masterpieces of French Literature. 3-3-0 or 0-3-3

Prerequisite: Junior or Senior standing.

The study of outstanding masterpieces of French literature. A brief outline of French literary development. Parallel reading either in translation or in French. An open elective. No language prerequisites. Mr. Hinkle.

M. L. 303. French Civilization. 3 or 3 or 3

Prerequisite: Junior or Senior standing.

After a preliminary survey of the land and people of France, such topics as language, arts, science, literature, philosophy, etc., are given consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Mr. Hinkle.

M. L. 411, 412. Introductory Scientific French. 3-3-0 or 0-3-3

Prerequisite: M. L. 201 or equivalent.

A study of scientific French of intermediate difficulty, supplemented with lectures on terminology and other linguistic technique. The needs of students whose interest is that of the acquisition of a reading knowledge of the language, constantly kept in view. Basic technique of translation explained and demonstrated by means of personal conferences. Staff.

M. L. 501, 502, 503. Advanced Scientific French. 3-3-3

Prerequisite: M. L. 311 or 312 or equivalent.

A study of scientific literature appearing in current bulletins, magazines and technical journals. Students given the opportunity of working a translation project in connection with their subject of major interest. Special attention given to the comprehension of the thought of the article under consideration and its accurate rendition into English. Parallel readings, reports and conferences. Staff.

GERMAN*

M. L. 103, 104. Elementary German. 3-3-0 or 0-3-3

Lectures on the structure and technique of the language, supplemented by easy readings and translations. Individual reports and conferences. Mr. Allred, Mr. Hinkle.

M. L. 204. German Conversation and Composition. 3 or 3 or 3

Prerequisites: M.L. 103, 104 or equivalent**.

A course for students who wish to attain proficiency in spoken German. Attention given to composition and practice in the use of the spoken language. Staff.

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* Courses numbered above M. L. 104 need not be followed as a sequence in their respective gamut.

** Two years of high-school work will be considered the equivalent of M. L. 103, 104.

M. L. 205. German Prose: Aus der deutschen Geschichte. 3 or 3 or 3
Prerequisites: M.L. 103, 104 or equivalent**.

Readings in the history and customs of Germany. Grammar review and emphasis on vocabulary building and improvement in reading ability.
Mr. Allred, Mrs. Hall.

M. L. 206. German Prose: Aus der deutschen Literatur. 3 or 3 or 3
Prerequisites: M.L. 103, 104 or equivalent**.

Brief survey of German literature, a study of representative authors and their contribution to the development of the German language and literature. Mr. Allred.

M. L. 304, 305. Masterpieces of German Literature. 3-3-0 or 0-3-3
Prerequisite: Junior or Senior standing.

The study of outstanding masterpieces of German literature. A brief outline of German literary development. Parallel readings either in translation or in German. An open elective. No language prerequisites.
Mr. Hinkle.

M. L. 306. German Civilization. 0-0-3 or 3-0-0
Prerequisite: Junior or Senior standing.

After a preliminary survey of the land and people of Germany, such topics as language, arts, science, literature, philosophy, etc., are given consideration. Parallel readings, reports, and conferencs. An open elective. No language prerequisites. Mr. Hinkle.

M. L. 414, 415. Introductory Scientific German. 3-3-0 or 0-3-3
Prerequisite: M. L. 204 or equivalent.

A study of scientific German of intermediate difficulty supplemented with lectures on terminology and other linguistic technique. The needs of students whose interest is that of the acquisition of a reading knowledge of the language, constantly kept in view. Basic technique of translation explained and demonstrated by means of personal conferences. Mr. Hinkle.

M. L. 504, 505, 506. Advanced Scientific German. 3-3-3
Prerequisite: M. L. 314 or 315 or equivalent.

Reading and translations of relatively difficult technical German, supplemented by lectures on terminology, word order, vocabulary analysis and other linguistic technique. Designed to meet the needs of students whose interest in the language is primarily that of reading ability. Choice of reading material adjusted to individual needs; may be taken by students of varying degrees of previous linguistic training. Mr. Hinkle.

SPANISH*

M. L. 105, 106. Elementary Spanish. 3-3-0 or 0-3-3 or 3-0-3

Structure, diction, pronunciation, and other matters of technique of the language, supplemented by easy readings. Individual reports and conferences. No previous training in the language necessary. Staff.

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* Courses numbered above M. L. 106 need not be followed as a sequence in their respective gamut.

M. L. 207. Spanish Conversation and Composition. 3 or 3 or 3
Prerequisites: M.L. 105, 106 or equivalent**.

This course is designed to give students an opportunity to acquire practice in spoken Spanish. Discussion in Spanish on subjects of general interest, advanced composition, and special emphasis on good pronunciation.

Mr. Poland.

M. L. 208. Spanish Prose: Iberia. 3 or 3 or 3
Prerequisites: M.L. 105, 106 or equivalent**.

Emphasis is placed upon translating Spanish prose and developing vocabulary. The readings give the student a comprehensive picture of the culture, geography, history and economy of Spain. Mr. Ballenger.

M. L. 209. Spanish Prose: Hispano-America. 3 or 3 or 3
Prerequisites: M.L. 105, 106 or equivalent**.

Emphasis is placed upon translating Spanish prose and developing vocabulary. The readings give the student a comprehensive picture of the culture, geography, history and economy of the Spanish American countries.

Mr. Ballenger.

M. L. 307, 308. Masterpieces of Spanish Literature. 3-3-0 or 0-3-3
Prerequisite: Junior or Senior standing.

The study of outstanding masterpieces of Spanish literature. A brief outline of Spanish literary development. Parallel readings either in translation or in Spanish. An open elective. No language prerequisites.

Messrs. Ballenger, Hinkle.

M. L. 309. Spanish Civilization. 0-0-3 or 3-0-0
Prerequisite: Junior or Senior standing.

After a preliminary survey of the land and people of Spain, such topics as language, arts, science, literature, philosophy, etc., are given special consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Messrs. Hinkle, Ballenger.

M. L. 317, 318. Technical Spanish. 3-3-0 or 0-3-3
Prerequisite: M. L. 207 or equivalent.

A study of technical and industrial literature. Particular attention given to the special terminology characteristic of such literature with a view to the acquisition of a practical vocabulary. Individual conferences and reports. Mr. Ballenger.

M. L. 407, 408, 409. Scientific Spanish. 3-3-3

Prerequisites: M. L. 317, 318 or equivalent.

A study of scientific literature appearing in current bulletins, magazines, and technical journals. Students given the opportunity of working a translation project in connection with their subject of major interest. Special attention given to the comprehension of the thought of the article under consideration and its accurate rendition into English. Parallel readings, reports, and conferences. Mr. Ballenger.

** Two years of high school work will be considered the equivalent of M.L. 105, 106.

RUSSIAN*

M. L. 110, 111, 112. Elementary Russian. 3-3-3

Structure and technique of the language, supplemented by easy readings and translations. Individual reports and conferences. Mr. Pikner.

M. L. 210. Russian Conversation and Composition. 3 or 3 or 3

Prerequisites: M.L. 110, 111, 112 or equivalent**.

A course for students who wish to attain proficiency in spoken Russian. Attention given to composition and practice in the use of the spoken language. Mr. Pikner.

M. L. 211. Russian Prose: History. 3 or 3 or 3

Prerequisites: M.L. 110, 111, 112 or equivalent**.

Readings in the history and customs of Russia. Grammar review and emphasis on vocabulary building and improvement in reading ability.

Mr. Pikner.

M. L. 212. Russian Prose: Literature. 3 or 3 or 3

Prerequisites: M.L. 110, 111, 112 or equivalent**.

Brief survey of Russian literature, a study of representative authors and their contribution to the development of the Russian language and literature. Mr. Pikner.

M. L. 319, 320. Introductory Scientific Russian. 3-3-0 or 0-3-3

Prerequisite: M.L. 210 or equivalent.

A study of scientific Russian of intermediate difficulty supplemented with lectures on terminology and other linguistic technique. The needs of students whose interest is that of the acquisition of a reading knowledge of the language, constantly kept in view. Basic technique of translation explained and demonstrated by means of personal conferences.

Mr. Pikner.

ENGLISH FOR FOREIGN STUDENTS

The following courses are designed for foreign students who do not speak English as their native language. The ultimate aim of all the courses is to give the student instruction and practice in the phases of American English most essential to a successful completion of his work. Attention is directed toward giving the student the ability to read texts, understand lectures, take notes, recite, ask questions, write required papers and conduct their daily affairs on a language basis approaching as nearly as possible that of English speaking students.

M. L. 107. Elementary English: Pronunciation. 3 or 3 or 3

Emphasis in this course is laid upon the pronunciation and comprehension of American English. Through oral reports students are encouraged to improve their diction and pronunciation. Comprehension is approached through dictation and lectures. Attention to grammar and spelling is given as individual problems arise. Mr. Poland.

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* Courses numbered above M.L. 112 need not be followed as a sequence in their respective gamut.

** Two years of high-school work will be considered the equivalent of M.L. 110, 111, 112.

M. L. 108. Elementary English: Reading. 3 or 3 or 3

Emphasis in this course is laid upon the rapid comprehension of written English without the necessity of the student's first translating the material into his own language. Exercises are given in paraphrasing the material read. Continued practice in pronunciation, spelling and grammar. Special attention is paid to idiomatic expressions and Amercanisms. Mr. Poland.

M. L. 109. Elementary English: Composition. 3 or 3 or 3

Emphasis in this course is laid upon the writing of English, special attention being given to compositions, grammatical exercises, sentence structure, spelling, and diction. Mr. Poland.

M. L. S-1. Oral Composition. 0-0-0

The principal objective of this course is that of broadening the student's vocabulary and improving his pronunciation and enunciation. Practice in speaking is emphasized and individual oral reports are required. Much time is spent on English sounds which present especial difficulty to foreigners. Mastery of such sounds before the end of the course is the ideal of attainment. Messrs. Hinkle, Poland.

M. L. S-2. Reading for Comprehension. 0-0-0

The basis for this course is the reading of classic and current literature. Emphasis is placed on daily oral or written reports paraphasing the material read. Oral reading exercises are given in which the student is required to reproduce the written page in an understandable and expressive manner. Messrs. Hinkle, Poland.

GENERAL COURSES

M. L. 321, 322. Masterpieces of Foreign Literature. 3-3-0 or 0-3-3

Prerequisite: Junior or Senior standing.

A study of outstanding literary productions in each of the various types of literature, and lectures on their cultural background. Designed primarily to meet the needs of students who wish to supplement their knowledge of their own literature with a survey of the literature of other civilizations. Special attention is given to the literary monuments of France, Germany, Spain, and Italy. No foreign language prerequisites are necessary. Daily reports and conferences. Messrs. Hinkle, Poland.

M. L. 323. The Development of Language. 3 or 3 or 3

Prerequisite: Junior or Senior standing.

The various phases of linguistic growth as a basis for intelligent language appreciation. Origin of language, linguistic change, grammatical categories, dialects, standard language, word order, inflection, isolation, agglutination, etymology, and other linguistic processes given special consideration. Parallel readings, reports, and conferences. An open elective. No language prerequisites. Mr. Hinkle.

OCCUPATIONAL INFORMATION AND GUIDANCE

Courses for Graduates and Advanced Undergraduates

Ed. 520. Principles of Guidance. 0-3 or 3

This course aims to help teachers, administrators, and other non-specialists to do better the guidance work for which they are responsible. The course will cover the principles and procedures of Guidance programs at the secondary school level. Consideration will be given to counseling with individuals regarding health, social, emotional, educational, and vocational problems. Mr. Tolbert.

Ed. 524. Occupational Studies. 0-0-3

This course is intended to acquaint individuals with the field of occupational information. An analysis will be made of the various types of occupations and occupational trends in North Carolina and the country as a whole. Mr. Tolbert.

Ed. 590. Individual Problems in Guidance. 0-3-0

Intended for individual or group studies of one or more of the major problems in Guidance and Personnel work. Problems will be selected to meet the interests of individuals. The workshop procedure will be used whereby special projects and reports will be developed by individuals and by groups. Messrs. Anderson, Tolbert.

Courses for Graduates Only

Ed. 631. Educational and Vocational Guidance. 3-0-0

This course aims to provide training for teachers who are part time or full time counselors, employment interviewers, social workers and personnel workers, who are aiding individuals with vocational adjustment problems. The course will cover the functions performed in vocational and educational guidance such as assembling and imparting occupational information, counseling regarding vocational and educational plans, the use of aptitude tests, placement in jobs and follow-up, and procedures in setting up services of vocational and educational guidance in schools, employment offices, and social service agencies. Mr. Anderson.

Ed. 632. Occupational Analysis. 0-3-0

This course is designed to aid counselors, employment workers, personnel managers, and research workers to study occupational trends and to make occupational studies. An analysis and an evaluation of the techniques and of the research will be made in the field of job analysis, job evaluation and job specifications. Implications for curriculum building, industrial personnel and vocational guidance are considered. Mr. Anderson.

Ed. 633. Techniques in Guidance and Personnel. 0-0-3

The aim of this course is to develop personnel techniques for counselors, social workers, employment interviewers, and industrial personnel workers. The techniques to be studied intensively are observation, interviews, counseling, rating scales, records and reports, and case study procedures. Students become acquainted with these techniques through lectures, demonstrations, and the study of case histories. Attention will be given to both diagnosis and treatment. Mr. Anderson.

Ed. 641. Field Work in Occupational Information and Guidance. Maximum 9 credits

A practical course in which the student undertakes field work in secondary schools, colleges, social service agencies, employment offices, and industrial establishments which carry on guidance and personnel work. The student may observe and participate in some personnel services and may study the organization and administration of Guidance Programs. Mr. Anderson.

Ed. 651. Research in Occupational Information and and Guidance. Maximum 9 credits

Qualified students will conduct investigations and research in Guidance and Personnel. Published reports and techniques of investigation will be analyzed and evaluated. Messrs. Anderson, Tolbert.

PHILOSOPHY AND RELIGION

Philosophy 200. Logic. 3 or 3 or 3

The establishment of reflective habits, the formal structure of reasoning, and the empiricism of modern science, with emphasis on reasoning as evaluation. Messrs. Bredenberg, Hicks.

Philosophy 201, 202, 203. Effective Living. 3-3-3

An integrative study of personal maturity, interpersonal adjustment, and ethical values to the end that the individual may formulate a personal philosophy of life as the foundation for useful career. Mr. Hicks and Staff.

Philosophy 204. Philosophy in the United States. 3 or 3 or 3

Philosophical systems as formulated and promoted by such Americans as Royce, James and Dewey, with emphasis on basic problems and trends in philosophy. Messrs. Bredenberg, Hicks.

Philosophy 300. Philosophy of Religion. 3 or 3 or 3

The psychological and sociological roots of religion, the historic concepts of God, soul, immortality, and modern trends in religious thought. Messrs. Gardner, Middleton.

Rel. 301. Religion in the United States. 3 or 3 or 3

Characteristics of the major religious sects of the United States and brief survey of trends in religious thought. Mr. Gardner.

Rel. 302. The Life of Jesus. 3 credits

The career of Jesus of Nazareth as recorded in the Synoptic Gospels and interpreted against the religious, economic, and political background of the age in which Jesus lived. Mr. Gardner.

Rel. 303. The Teachings of Jesus. 3 or 3 or 3

The teachings of Jesus as recorded in the New Testament, with special emphasis on the origin and content of the Gospels and Epistles, the major religious and ethical principles involved, and consideration of applicability to modern life. Messrs. Gardner, Middleton.

Rel. 304. Comparative Religion. 3 or 3 or 3

History, general characteristics, and social significance of living religions of the world, with brief consideration of contemporary secular movements that are in a sense religious. Messrs. Gardner, Middleton.

Rel. 305. Religious Education. 3 credits

Prerequisite: Approval of Department.

Survey of the contemporary educational organization and practice of the major denominations in the United States. Lectures, personal conferences and field assignments. Mr. Hicks.

Philosophy 306. Aesthetics. 0-3-0

Theory of beauty and aesthetic experience, analysis of specific media of artistic expression, and the formulation of a philosophy of art which relates the beautiful and the useful. Mr. Bredenberg.

Philosophy 309. Marriage and Family Living. 3 or 3 or 3

Prerequisite: Approval of Department. Sections limited to 25 students.

The findings of several fields of knowledge brought to focus upon the personal problems of premarriage and postmarriage adjustment, with emphasis upon the ethical and moral foundations of marriage and the formulation of a philosophy of marriage. Lectures, discussion and personal conference.

Messrs. Hicks, Middleton.

Philosophy 311. Parent-Child Relations. 3 or 3 or 3

Prerequisite: Approval of Department. Sections limited to 25 students.

Principles of inter-personal relationships of the family circle, with emphasis upon the enhancement of democratic values and the attainment of growth through the exercise of freedom, moral responsibility, and creative activity. Mr. Hicks.

Philosophy 400. Foundations of Science. 0-0-3

Nature and validity of knowledge, basic concepts of modern science, scientific method, and the implications of the philosophy of modern science for ethics, social philosophy, and the nature of reality. Mr. Bredenberg.

Rel. 408. Christian Personality in Its Psychological Aspects. 3 credits

Prerequisite: Six term credits in Religion or related fields.

An analysis of the psychological validity of the principal ethical teachings of the Sermon on the Mount with emphasis on the relationship of religious attitudes and practices to mental and emotional stability and maturity.

Mr. Gardner.

Courses for Graduates and Advanced Undergraduates

Philosophy 505. Social Ethics. 0-0-3

Prerequisite: Six term credits in Philosophy or related fields.

Review of the ethical codes of professional groups, with analysis of the nature, evolution, and significance of moral values in personal and group life. Messrs. Bredenberg, Middleton.

Rel. 506. Problems of Religion. 3 credits

Prerequisite: Six term credits in Religion or related fields.

Religious verities in an age of science and problems of the church in modern times. Mr. Gardner.

Philosophy 507. Ethical Problems of Adolescence. 3 credits

Prerequisite: Six term credits in Philosophy or related fields.

Typical adjustment problems of modern youth, with special consideration to the determination of standards of behavior and the sources of motivation for right conduct. Mr. Hicks.

PHYSICAL EDUCATION

Six terms of Physical Education are required for graduation. Advisers should register students in number sequence.

Insofar as facilities and staff will permit, every possible effort is made to direct students into activities which will best meet their individual needs. The basis for determining individual needs is as follows: i.e., an athletic ability test, a swimming test, a hygiene test, the medical examination, and a personal interview with the student—all of which are normally completed during orientation week.

All freshman and transfer students who fail the swimming test are immediately assigned to beginning swimming. Students who pass the swimming test are classified primarily on the basis of their respective scores in the athletic ability test. The requirement is organized into Fundamental Sports, Basic Sports, and Elective Sports. Those who score in the top 25 per cent are immediately directed to the controlled Elective Sports Area. Those who score below the 15th percentile, are enrolled in the Fundamental Sports Area, where more individual attention can be made available to improve their skill deficiency. All students scoring between the 15th and 75th percentiles are placed in the Basic Sports program for three quarters, or until their improvement indicates that they are ready for the Elective Sports program.

In case a student has some unusual physical impairment, the college physican will either excuse him from physical education, or recommend a special type of activity suitable to his particular needs.

Normally all second year students participate in the Elective Sports program. This part of the program is controlled to the extent that a student may not receive credit in more than two team sports during his six terms of Physical Education. See list of activities offered each term.

Activities

Fall	Winter	Spring
Beginning Swimming	Basketball*	Advanced Tennis
Beginning Tennis	Bowling	Badminton
Handball	Boxing	Golf
Intermediate Swimming	Gymnastics	Handball
Soccer*	Handball	Intermediate Swimming
Volleyball*	Intermediate Swimming	Life Saving
Wrestling	Wrestling	Softball*
		Volleyball*

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* Team sports.

P. E. 100. Personal Hygiene. Staff.

P. E. 101, 102, 103. Physical Education 1 or 1 or 1
Staff.

P. E. 201, 202, 203. Physical Education. 1 or 1 or 1
Staff.

Note: Lectures on personal hygiene required in one term only.

PHYSICS

Courses for Undergraduates

Phys. 201, General Physics. 5 or 5 or 5
202, 5 or 5 or 5
203. 5 or 5 or 5

Co-requisite: Math. 201.

Required of sophomores in Engineering and Agricultural curriculum B.

General Physics, somewhat more analytical in content than Physics 211, 212, 213, stressing problem solution and engineering applications. Recitations, demonstrated lectures, problem drill and laboratory work are coordinated to give a working knowledge of the basic principles of Physics. Phys. 201, mechanics; Phys. 202, sound and electricity; Phys. 203, heat and light. **Staff.**

Phys. 211, **General Physics.** **4 or 4-0**
212, **0-4 or 4**
213. **0-0-4**

Prerequisite: Math. 102.

Recitations with demonstrations and laboratory work. Phys. 211, mechanics; Phys. 212, heat and light; Phys. 213, sound and electricity. Staff.

Phys. 215. General Physics. 5 or 5 or 5

Prerequisite: Math. 112.

Required of sophomores in agricultural curriculum A.

Recitations with demonstrations and laboratory work; a short course with emphasis on mechanics, heat and weather, applications of optics and electricity on the farm. **Staff.**

Phys. 223. Astronomy and Astrophysics. 0-0-3

Prerequisites: Phys. 211, Math. 103.

A general course in astronomy and astrophysics. Introduction to techniques and procedures in astronomical observations. Occasional laboratories; observations with telescope.

Phys. 301, 302, 303. Intermediate Physics I. 4-4-4

Prerequisite: Phys. 203.

Mechanics, heat, and sound on an intermediate level. Intermediate Physics I, together with Intermediate Physics II (401, 402, 403), constitutes an integrated study of classical physics at the next level above general sophomore physics. Lectures, problems, and recitations, and one laboratory each week.

Phys. 311. Light and Color in Industry. 3-0 or 3

Prerequisite: Phys. 213.

Survey of the fundamental principles of light and radiation; photometry, illumination and distribution of light; lighting calculations; flourescent lighting; the physiological and psychological aspects of light and color; color theories, standardization of color; color contrast, and color harmony. Special emphasis placed on development of color harmony.

Phys. 322. Descriptive Meteorology. 0-3-0

Prerequisite: Phys. 212.

Explanation of the weather and associated phenomena at an introductory level. Structure of the atmosphere; instrumentation; heat balance and primary circulation of the atmosphere; air masses, fronts, and waves; tertiary circulations; atmosphere of the lowest 10 meters.

Phys. 323. Applied Meteorology. 0-0-3

Prerequisite: Phys. 322.

Technique of application of meteorological data to problems in Engineering, Agriculture, Forestry, etc., where weather is a factor, using principle of expectations as the basis for analysis. Examples from several fields as illustrations of various analysis techniques.

Phys. 327. Laboratory Techniques in Photography. 3-0-0

Prerequisite: Phys. 203.

A treatment of the general principles of photography with special applications in the fields of spectrography, micrography, Roentgenology, and nuclear physics.

Phys. 401, 402, 403. Intermediate Physics II. 4-4-4

Prerequisites: Phys. 203, Math. 401.

Electricity, magnetism, and optics on an intermediate level. Intermediate Physics II, together with Intermediate Physics I, constitutes an integrated study of classical physics at the next level above general sophomore physics. Lectures, problems, recitations, and one laboratory each week.

Phys. 407. Introduction to Modern Physics. 3 or 3 or 3
Prerequisites: Phys. 203, Math. 303.

A brief survey of the important developments in atomic and nuclear physics. Topics covered include: atomic and molecular structure, determination of the mass and charge of ions, origin of spectra, ion accelerators, nuclear reactions, and cosmic rays. Particular attention is paid to the practical applications of these developments.

Phys. 410. Nuclear Physics I. 4 or 4-0
Prerequisite: Phys. 407.

An introductory treatment of the properties of nuclear particles and their interactions with matter. Consideration is given to natural and artificial radioactivity, nuclear reactions, fission, and the structure of simple nuclei. A three-hour laboratory is included.

Phys. 411. Nuclear Instrumentation. 3-0 or 3
Prerequisite: Phys. 410.

This is a laboratory course designed to acquaint students with the principles of operation of apparatus used for measuring ionizing radiations. One lecture and two laboratory periods per week.

Phys. 418. Radiation Hazard and Protection. 0-3-0
Prerequisite: Phys. 410.

A survey of the precautionary methods used in radioactive work. Safe limits of exposure and tolerance dosage of alpha, beta, gamma, and neutron radiation; monitoring procedures; calculation of exposure doses; and general protective methods are discussed.

Phys. 419. Introduction to Nuclear Engineering. 0-3-0
Prerequisite: Phys. 410.

A survey of the engineering applications of nuclear energy. The principles and practices of isotope separation, production of plutonium, and nuclear reactor operation are studied along with the peace-time uses of products and by-products of nuclear reactors. Major engineering problems involved in each phase of the study are defined and the special methods of approach indicated.

Courses for Graduates and Advanced Undergraduates

Phys. 510. Nuclear Physics II. 0-4-0
Prerequisite: Phys. 410.

A continuation of physics 410 with particular emphasis on neutron physics, nuclear energy levels, meson theory, nuclear resonance, atomic and molecular magnetism, and cosmic radiation. A three-hour laboratory is included.

Phys. 520. Physical Technology in Radioactivity. 0-4 or 4
Prerequisite: Phys. 410.

Emphasis in this course is on laboratory practices in detecting, handling, and quantitatively measuring radioactive samples. The preparation of samples for radioactivity measurements and the calculation methods used in analyzing such data are summarized. At least three hours of laboratory practice per week.

Phys. 526. Ionization Phenomena and Electron Optics. 0-0-3
Prerequisites: Phys. 403, Phys. 410.

Methods of producing ions, and the interaction of ions with electric and magnetic fields are discussed, together with a brief survey of the present status of electron optics.

Phys. 530. Elementary Nuclear Reactor Theory. 0-0-3
Prerequisites: Phys. 410; Math. 511 or Math. 532.

A lecture course in the principles of chain reactors. Slowing down of neutrons, neutron diffusion equations, space distribution of neutrons, conditions for criticality, reactor dimensions for simple geometries, elementary group theories, and time dependent reactor behavior.

Phys. 531, 532, 533. Advanced Physical Measurements. 2-2-2
Prerequisites: Phys. 203, Math. 303.

Covers the technique and theory of advanced experiments in mechanics, heat, sound, light, and electricity. The treatment and interpretation of data are stressed.

Phys. 544. Vibration and Wave Motion. 0-3-0
Prerequisites: Phys. 203, Math. 401.

The dynamics of vibratory and oscillatory motion. Analogies in mechanical, electrical and acoustical vibrating systems. Analysis of wave motion and propagation in different media.

Phys. 545. Applied Acoustics. 0-0-3
Prerequisite: Phys. 544.

The dynamical theory of sound. Sources of sound, measurement of sound intensity, measurement of frequency, acoustical impedance and transmission of sound, sound filters and resonators, acoustics of speech and hearing, reception and reproduction of sound, acoustics of buildings.

Phys. 551. Introduction to X-Rays. 3-0-0
Prerequisites: Phys. 203, Math. 303.

Topics include detection of defects in welds and castings, crystal and powder diffraction, and fiber and particle size measurement. Enough theory is included to provide intelligent guidance in the applications of x-rays, but the main emphasis is on laboratory practice.

Phys. 552. X-Ray Theory and Optics. 0-3-0
Prerequisites: Phys. 203, Math. 303; Phys. 551 recommended.

Emphasis is placed upon the origin of x-rays and the optical principles underlying the diffraction of x-rays. Methods of determining crystal structure by means of x-ray diffraction are considered. The demonstration of x-ray equipment with occasional manipulation by the student is a part of the course.

Phys. 553. Structure of Solids; Crystallography. 0-0-3
Prerequisites: Phys. 203, Math. 303; Phys. 552 recommended.

Elementary consideration of amorphous and crystalline solids, metals, conductors, non-conductors, and semi-conductors. Some optical crystallography is included.

Courses for Graduates Only

Phys. 601, 602, 603. Advanced General Physics. 3-3-3

Prerequisites: Phys. 402, Math. 511.

Mathematical and theoretical approach to relationships between the various branches of physics, with applications to mechanical, electrical, optical, thermal, and vibratory problems. Generalization of underlying physical principles.

Phys. 610. Advanced Nuclear Physics. 0-0-3

Prerequisite: Phys. 410; Phys. 611 is recommended.

Current hypotheses of nuclear structure and reactions, including fission, theories of alpha emission, deuteron binding, neutron-proton scattering, the compound nucleus, and beta-decay. The use of neutrons in present day nuclear research is emphasized.

Phys. 611, 612, 613. Quantum Mechanics. 3-3-3

Prerequisites: Phys. 407, Math. 532.

Theory of quantum mechanics with applications to atomic and molecular structure, scattering phenomena, and the interaction of radiation with matter.

Phys. 618. Advanced Radiation Hazard and Protection. 0-0-3

Prerequisite: Phys. 418.

Further consideration of safe practices in handling radioactive materials. Calculation of necessary shielding conditions for various geometries and combinations of radiations.

Phys. 619. Reactor Design. 3-0-0

Prerequisite: Phys. 530.

Engineering design of typical reactors of various kinds: homogeneous, heterogeneous, stationary power, power-breeder, experimental, aircraft propulsion. The problems involved in the choice of materials of construction, medium for heat exchange, and reactor control are considered. Principles of heat transfer are developed as needed.

Phys. 621. Kinetic Theory of Gases. 3-0-0

Prerequisites: Phys. 203, Math. 511.

The theory of molecular motion, including the velocity and density distribution functions, the phenomena of viscosity, heat conduction and diffusion; equations of state; fluctuations.

Phys. 622, 623. Statistical Mechanics. 0-3-3

Prerequisites: Phys. 203, Math. 511; Phys. 621 is recommended.

A treatment of statistical mechanics from both the quantum and classical point of view. Development of theories from the thermodynamical standpoint and their practical application.

Phys. 625. High Vacuum Technique. 0-0-3

Prerequisite: Phys. 621.

A course in the design and maintenance of vacuum systems. Consideration is given to calculation of pumping speeds, detection of leaks, absolute and relative measurements of pressure.

Phys. 630. Advanced Reactor Theory. 3-0-0

Prerequisite: Phys. 530.

The mathematical and physical description of neutron motion and reactor behavior. The two-and multi-group methods of calculating critical dimensions and neutron flux; determination by the use of transport theory of the limitations of diffusion theory; resonance capture in uranium and thermal utilization for heterogeneous reactors.

Phys. 631, 632. Atomic Spectra. 3-3-0

Prerequisite: Phys. 403. Co-requisites: Phys. 611, Math. 532.

Atomic models and coupling schemes. Multiple series, Zeeman, Paschen-Back, and Stark effects. Hyperfine structure and complex spectra.

Phys. 633. Molecular Spectra. 0-0-3

Prerequisite: Phys. 403. Co-requisites: Phys. 611, Math. 532.

Spectra of polyatomic molecules. Infrared and Raman Spectroscopy, with applications to various chemical problems.

Phys. 661, 662, 663. The Solid State. 3-3-3

Prerequisite: Phys. 553.

The electron theory of conduction, electrical and thermal conduction in solids, and surface phenomena, with applications to physical behavior and usage of solids. (Offered in 1952-53 and alternate years.)

Phys. 670. Seminar. 1 to 3

Literature surveys and oral presentation of papers on special topics.

Phys. 690. Research. 1 to 9

Graduate students sufficiently prepared may undertake research in some particular field of Physics.

PLANT PATHOLOGY

Courses for Undergraduates

Pl. Path. 315. Plant Diseases. 0-0-4

Prerequisites: Botany 101 and 102.

An introduction to the nature, causes and control of the major types of diseases affecting crop plants. Mr. Kelman.

Pl. Path. 318. Diseases of Forest Trees. 4-0-0

Prerequisites: Botany 101 and 102.

An introduction to the nature, causes and control of the more important diseases of forest trees. Mr. Kelman.

Courses for Advanced Undergraduates and Graduate Students

Pl. Path. 501. Research Methods in Plant Pathology. 5-0-0

Prerequisites: Plant Pathology 315 and permission of the instructor.

Introduction to research techniques and practices in the operation of research equipment used in laboratories and greenhouses for investigating diseases caused by bacteria, fungi, nematodes, viruses and physiogenic factors. Exercises are directed also toward procedures involved in appraising plant pathology research problems, reviewing literature and preparing a manuscript. Mr. Nielsen.

Pl. Path. 515. Diseases of Field Crops. 4-0-0
Prerequisite: Plant Pathology 315.
An advanced study of the more important diseases of field crops such as cotton, corn, tobacco, soybean, alfalfa, clover, grasses and small grains with major emphasis on identification, cause and control. Mr. Lucas.

Pl. Path. 516. Diseases of Fruit Crops. 0-3-0
Prerequisite: Plant Pathology 315.
Study of causes, symptoms, epiphytology and principles of control of major diseases of pome, stone, nut, and berry crops. Mr. Clayton.

Pl. Path. 517. Diseases of Vegetable Crops. 0-3-0
Prerequisite: Plant Pathology 315.
Advanced study of the nature, cause and control of the more important diseases of vegetable crops. Mr. Ellis.

Pl. Path. 601. Phytopathology. 0-5-0
Prerequisites: Plant Pathology 315 and permission of the instructor.
Fundamental principles of the etiology, epiphytology and control of plant diseases. Mr. Nusbaum.

Pl. Path. 615. Plant Pathology Research. Credits by arrangement
Prerequisite: Graduate standing and consent of instructor.
Research on specific problems in Plant Pathology including the thesis problem. A maximum of nine credits is allowed toward the Master's degree, and any number toward the Doctorate. Staff.

Pl. Path. 625. Plant Pathology Seminar. 1-1-0
Prerequisite: Graduate standing in Plant Pathology.
Discussion of phytopathological topics.
A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

POULTRY

Courses for Undergraduates

Poul. 101. General Poultry. 3-0 or 3
Fundamental principles of poultry production. Classes, breeds and variety identification. Breeding, incubation, raising, housing, feeding, disease, and marketing. Mr. Brown.

Poul. 301. Poultry Judging. 4-0-0
Prerequisite: Poul. 101.
Required of majors in Poultry Science, elective for others.
Judging of poultry for egg production, exhibition, breeding purposes, market qualities; judging dressed market birds; eggs. Mr. Brown.

Poul. 303. Hatchery Management. **0-0-4**
Prerequisite: Poul. 101.
Required of majors in Poultry Science; elective for others.
Principles of incubation and brooding; feeding, housing, and raising baby chicks; hatchery management. Mr. Brown.

Poul. 311. Poultry Anatomy and Physiology. **5-0-0**
Prerequisites: Poul. 101, Zool. 101.
Required of majors in Poultry Science; elective for others.
A foundation course for junior and senior courses. Dissection and study of the gross structures and functions of the organs and systems of the embryo, baby chick, chicken and adult bird. Mr. Cook.

Poul. 322. Poultry Production. **0-4-0**
Prerequisite: Poul. 101.
(Not for majors in Poultry Science.)
Developed for vocational teachers in agriculture. Poultry disease problems, nutritional problems. Mr. Brown.

Poul. 332. Preparation and Grading of Poultry Products. **0-3-0**
Prerequisite: Poul. 101.
Required of majors in Poultry Science; elective for others.
Commercial fattening; dressing, processing, refrigeration, and storage; egg candling, grading, processing and storage; preparation for marketing. Mr. Brown.

Poul. 342. Turkey Production. **3-0-0**
Prerequisite: Poul. 101.
Required of majors in Poultry Science; elective for others.
Principles of selection and mating; incubation; brooding; nutrition, grading and marketing. Disease problems of turkeys. Mr. Kelly.

Poul. 351. Advanced Poultry Judging. **3-0-0**
Prerequisites: Poul. 101, 301.
Elective for seniors in Poultry Science and others.
Advanced judging of poultry for egg production, exhibition, breeding purposes, market qualities; judging dressed market birds; eggs. Mr. Brown.

Courses for Advanced Undergraduates

Poul. 401, 402. Poultry Diseases. **0-4-4**
Prerequisites: Poul. 101, Bot. 412. Poul. 401 prerequisite to Poul. 402.
Required of majors in Poultry Science; elective for others.
The prevention, control, and treatment of the diseases of poultry. Mr. Cox.

Poul. 412. Commercial Poultry Plant Management. **0-0-3**
Prerequisites: Poul. 101, 303, 520, 521.
Required of majors in Poultry Science; elective for others.
Development and organization of plans for the building, operation and maintenance of a commercial poultry plant. Problem. Mr. Kelly.

Poul. 423. Poultry Seminar. One credit per term

Prerequisite: Junior and senior courses in Poultry Science.

Required of seniors in Poultry Science.

Topics and problems relating to Poultry Science and Poultry Industry assigned for report and discussion. Three terms. Staff.

Poul. 520. Poultry Breeding. 0-4-0

Prerequisites: Poul. 101, Gen. 411.

Required of majors in Poultry Science; elective for others.

Application of genetic principles to poultry breeding, considering physical traits and physiological characteristics—feather patterns, egg production, hatchability, growth, body conformation, and utility. Laboratory problems and analysis of progeny performance records. Mr. Glazener.

Poul. 521. Poultry Nutrition. 0-4-0

Prerequisites: Zool. 101, Chem. 203.

Required of majors in Poultry Science; elective for others.

Protein, vitamin and mineral requirements for growth, egg production and reproduction. Methods of feeding and compounding poultry mashes. Mr. Kelly.

Poul. 530. Poultry Immunology. 0-0-3

Prerequisites: Poul. 401, 402; Bot. 412.

Elective for advanced students. The fundamentals of immunization and sero-diagnosis in the prevention and control of infectious diseases of poultry. Mr. Cox.

Courses for Graduates Only

Poul. 601. Advanced Poultry Genetics. 3-0-0

Prerequisite: Graduate standing in Poultry Science.

Study of lethals, skeletal and feather variations. Linkage and chromosome mapping of the fowl. Theory and contemporary ideas concerning genetics of egg and meat production. Mr. Glazener.

Poul. 602. Advanced Poultry Nutrition. 3 or 3 or 3

Prerequisite: Graduate standing in Poultry Science.

Selected problems involving experimental methods employed to produce nutritional deficiencies in chickens and turkeys. Interpretation and presentation of data collected. Mr. Kelly.

Poul. 603. Poultry Histology. 5 or 5 or 5

Prerequisite: Graduate standing in Poultry Science.

Poultry tissues and their preparation. Study and interpretation of the microscopic anatomy of the normal tissues prepared by the student. Principles of histology. Mr. Cook.

Poul. 604. Poultry Histopathology. 5 or 5 or 5

Prerequisites: Graduate standing in Poultry Science, Poul. 603.

Study and interpretation of the microscopic anatomy of the diseased tissues prepared by the student. Principles of pathology. Mr. Cook.

Poultry. 605. Poultry Hematology. 5 or 5 or 5

Prerequisites: Graduate standing in Poultry Science, Poul. 603, 604.

Histology and histopathology of the blood forming tissues. Morphology of the normal and pathologic blood cells; supravital and fixed smear technics. Clinical methods and instruments. Principles of hematology.

Mr. Cook.

Poul. 611. Poultry Research. Credits by arrangement

Prerequisite: Graduate standing in Poultry Science.

Appraisal of present research, critical study of some particular problem involving original investigation. Problems in poultry breeding, nutrition, diseases, histology, histopathology or hematology.

A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

Poul. 614. Seminar Credits by arrangement

Prerequisite: Graduate standing in Poultry Science.

Required of graduate students majoring in Poultry Science.

A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

PSYCHOLOGY

Courses for Undergraduates

Psychol. 200. Introduction to Psychology. 3 or 3 or 3

A study of the general characteristics and development of human behavior, emphasizing the problems of motivation, emotion, learning, and thinking. Staff.

Psychol. 201. Elementary Experimental Psychology. 3-0-0

Prerequisite: Psychology 200.

Introduction to experimental psychology. One lecture and two laboratory periods per week. Mr. Barkley.

Psychol. 302. Psychology of Personality and Adjustment. 3-3-0

Prerequisite: Psychology 200.

A study of the factors involved in the development of the normal personality, emphasizing the principal factors controlling human behavior and their relationship to adjustment mechanisms. Messrs. Caffey, Corter.

Psychol. 304. Educational Psychology. 3 or 3 or 3

Required of students in Education.

Applications of psychology to education; problems of learning, motivation, interests; the measurement of educational efficiency; mental hygiene.

Messrs. Johnson, Barkley.

Psychol. 307. General Applied Psychology. 0-0-3

Prerequisite: Psychology 200.

A study of the application of principles of psychology in medicine, law, advertising, selling, vocational guidance, the arts, and athletics.

Messrs. Barkley, Caffey.

Psychol. 337. Industrial Psychology I. 3 or 3 or 3

Prerequisite: Psychology 200.

The application of psychological principles to the problems of modern industry; selection and placement of workers. Messrs. Moffie, Solem.

Psychol. 338. Industrial Psychology II. 3 or 3 or 3

Prerequisite: Psychology 200.

The application of psychological principles to the problems of modern industry; industrial learning, methods of work, monotony, fatigue, accidents, illumination, and morale of workers. Messrs. Moffie, Solem.

Psychol. 439. Psychology of Industrial Training. 0-3-0

Prerequisites: Psychology 200, and three additional hours in Psychology.

A study of the factors involved in training an employee to perfom a certain task requiring skills that he does not already possess. Consideration of effective methods for training inspectors, apprentices, and supervisors. Mr. Solem.

Psychol. 440. Interviewing and Counseling in Industry. 0-0-3

Prerequisites: Psychology 200, and 3 additional hours in Psychology.

A study of the principles of interviewing and counseling; trends in methods and techniques including non-directive and direct techniques. Course is designed for the undergraduate student and application made to industry. Mr. Solem.

Psychol. 476. Psychology of Adolescence. 0-3 or 3

Prerequisite: Psychology 304.

Mental growth, social development, and interests of adolescent boys and girls. Messrs. Johnson, Barkley.

Psychol. 490. Social Psychology. 0-0-3

Prerequisite: Psychology 200.

Social applications of psychology: social stimulation, response, and attitudes. Mr. Barkley.

Courses for Advanced Undergraduates and Graduates

Psychol. 501. Intermediate Applied Experimental Psychology. 0-3-0

Prerequisite: Six hours in Psychology.

Experimental study of problems in the major areas of general and theoretical psychology which have special significance in educational, industrial, and applied social psychology. Emphasis will be placed upon description of problems, study of methods, design of experiments, and procedures for the analysis and presentation of data. One lecture and two laboratory periods per week. Mr. Barkley.

Psychol. 504. Advanced Educational Psychology. 0-0-3

Prerequisite: Psychol. 304.

An advanced course giving a critical appraisal and a consideration of the practical applications for vocational education of modern psychological findings. Messrs. Barkley, Johnson.

Psychol. 511. Advanced Social Psychology. 0-0-3
Prerequisites: Psychol. 200, 490.

A study of social relationships and their psychological bases; emphasis on those aspects of behavior determined by personal interactions; work will involve anaylsis of representative research studies, and doing individual projects in industrial and rural areas. Mr. Barkley.

Psychol. 530. Abnormal Psychology. 0-0-3
Prerequisites: Psychology 200, 302.

A study of the causes, symptomatic behavior, and treatment of the major personality disturbances, emphasis also placed on preventive mental hygiene methods. Mr. Corter.

Psychol. 535. Tests and Measurements. 0-0-3
Prerequisite: Psychology 304.

A study of available tests, with emphasis on proper selection and use of testing instruments; also a study of statistical procedures needed in the proper use of tests, including measures of central tendency, variability and correlation. Messrs. Moffie, Johnson.

Psychol. 550. Mental Hygiene in Teaching. 0-3-0
Prerequisite: Six hours in Psychology.

A survey of mental hygiene principles applicable to teachers and pupils; practical problems in prevention and treatment of psychological problems in schools; case studies and research. Mr. Corter.

Psychol. 560. Psychometric Methods I. 0-3-0
Prerequisite: Six hours in Psychology.

Analyzes the steps necessary for the development of tests, including job analysis, test development of different types of items, item analysis, establishment of norms and determination of reliability. Emphasis placed on construction of mechanical tests with application to industry. Students will be given opportunity for construction of tests. Mr. Moffie.

Psychol. 561. Psychometric Methods II. 0-0-3
Prerequisite: Psychol. 560.

Emphasis placed on criterion analysis; rating scale methods, validation procedures. Attention will be directed to the validation of tests constructed in Psychology 560. Mr. Moffie.

Psychol. 564. Psychological Aspects of Occupational Vision. 0-0-3
Prerequisite: Six hours in Psychology.

Consideration given to the importance of vision in school, business, and industry; the relation between vision and job success. A survey of professional visual services and commercial visual screening instruments. Study of research and research methodology in occupational vision. Mr. Kelley.

Psychol. 570. Psychodiagnostic Techniques I. 3-0-0
Prerequisites: Six hours in Psychology.

An introduction to individual intelligence testing, theoretical background of intelligence testing, clinical introduction to intelligence testing, case studies and research. Mr. Corter.

Psychol. 571. Psychodiagnostic Techniques II. 0-3-0

Prerequisite: Psychology 570 or equivalent.

A practicum in individual adult intelligence testing with emphasis on the Wechsler-Bellevue, other performance tests of intelligence, report writing, and case studies. Mr. Corter.

Psychol. 572. Psychodiagnostic Techniques III. 0-0-3

Prerequisite: Nine hours in Psychology, including Psychology 570 or equivalent.

A practicum in individual intelligence testing of infants, children and adults with emphasis on the Stanford-Binet, other tests, report writing, case studies, and consultation with teachers. Mr. Corter.

Psychol. 576. Advanced Adolescent Psychology. 0-0-3

Prerequisites: Psychology 304 and 476.

An advanced course in psychology of adolescence in which the student considers the original works of leaders in this field, thus, laying the foundation for a critical appreciation of the new studies that are constantly appearing. Mr. Johnson.

Psychol. 578. Individual Differences. 3-0-0

Prerequisite: Six hours in Psychology.

Nature, extent, and practical implications of individual differences and individual variation. Mr. Barkley.

Courses for Graduates Only

Psychol. 604. Applied Experimental Psychology. 0-0-3

Prerequisite: Twelve hours in Psychology.

Experimental analysis of problems of sensation, perception, learning, thinking, emotions, fatigue, and neuro-muscular reactions. Emphasis upon methods of experimental control, design of experimental apparatus, and accuracy of reports as these are related to laboratory investigations in the fields of applied psychology. Mr. Barkley.

Psychol. 605. Advanced Industrial Interviewing and Counseling. 0-0-3

Prerequisite: Twelve hours in Psychology.

Interviewing, counseling, and psychotherapy; trends in methods and techniques, including non-directive or client-centered therapy. Application made to industry. Mr. Solem.

Psychol. 607. Advanced Industrial Psychology I. 3-0-0

Prerequisite: Twelve hours in Psychology.

Discussion, analysis and evaluation of psychological problems in industry; selection and placement of the worker. Emphasis on current research and study of psychological programs operating in different industries. Messrs. Moffie, McGehee.

Psychol. 608. Advanced Industrial Psychology II. 0-3-0

Prerequisite: Twelve hours in Psychology.

Discussion, analysis and evaluation of psychological problems in industry; training, morale, attitudes, fatigue, accidents, and maladjusted workers.

Emphasis on current research and study of psychological programs operating in different industries. Messrs. Moffie, McGehee.

Psychol. 609. Psychological Clinic Practicum. 0-0-3
Prerequisite: Twelve hours in Psychology.
Clinical participation in interviewing, counseling, psychotherapy and administration of psychological tests. Practicum to be concerned with college students, adults and children. Mr. Corter.

Psychol. 610. Applied Implications of Theories of Learning. 0-3-0
Prerequisite: Twelve hours in Psychology.
A study of theories of learning with emphasis upon applications of the principles of learning in industrial and school situations.
Messrs. Barkley, Johnson.

Psychol. 612. Research in Psychology. Maximum 9 credits
Prerequisite: Twelve hours in Psychology.
Individual or group research problems; a maximum of six credits is allowed toward the Master's degree. Staff.

Psychol. 616. Seminar in Industrial Psychology. 0-0-3
Prerequisite: Twelve hours in Psychology.
Scientific articles, analysis of experimental designs in industrial psychology, and study of special problems of interest to graduate students in Industrial Psychology. Staff.

RURAL SOCIOLOGY

Courses for Undergraduates

Rural Soc. 201. Social Problems of Rural Life. 3 or 3 or 3
Nature of rural society; family; community; farm labor; population trends; standards of living; land tenure; rural-urban differences; institutions and organizations; cooperation; housing; health and medical care; recreation and cultural activities; social security; international aspects; social planning for a better rural life. Staff.

Rural Soc. 321. Introduction to Social Research. 3-0-0
Elementary principles, methods and techniques in scientific social research. Includes planning, organization, preparing schedules and questionnaires, interviewing, sampling, simple forms of tabulation and chart making, and summarizing results. Mr. Lowry.

Rural Soc. 322. Introduction to Rural Social Work. 0-3-0
History and outline of social work. Case work, child and family, medical and psychiatric aspects, probation and parole, public welfare and assistance, group social work, and community organization. Mr. Mayo.

Rural Soc. 333. Rural Social Structure. 0-0-3
The study of way in which social life is ordered in rural society through stratification, locality groups, institutions, and organizations. The institutions and organizations of rural life are analyzed in terms of their functions, patterns of relationship, and processes of change. Mr. Green.

Rural Soc. 411. Rural Population Problems. 0-3-0

The number and distribution in relation to natural resources; physical and demographic characteristics; marriage rates; natural increase; migration; morbidity; mortality; occupations; rural-urban comparisons; trends; and national policies. Mr. Mayo.

Rural Soc. 412. Rural Family Living. 0-3-0

Theories, problems, and surveys of rural standards and conditions of living. Forces and programs affecting present day standards. Mr. Hamilton.

Rural Soc. 441. Rural Social Pathology. 3-0-0

Problems of the individual arising out of the failure to adjust in society: such as juvenile deliquency, crime and mental disorders. Problems of family and community disorganization; and economic maladjustments. Mr. Mayo.

Rural Soc. 513. Community Organization. 0-0-3

Community Organization in North Carolina and other states; structure and size; institutions and service agencies; disorganization; techniques and methods of organization; leadership and the relation of organizations to State and National agencies. Mr. Mayo.

Rural Soc. 521. Rural Social Psychology. 0-0-3

Characteristic mental traits and attitudes of rural people in relation to social organization and social change. Mr. Lowry.

Rural Soc. 522. Social Aspects of Land Tenure. 0-0-3

Character and history of different types of land tenure; origins and growth of farm tenancy in the United States; social correlatives of land tenure; landlord-tenant relationships; farm leases; problem of ownership; farm mortgages; reform programs. Mr. Green.

Rural Soc. 532. Social Security of Rural People. 0-3-0

Analysis of the major fields of security and insecurity in American rural life. Problems of insecurity are studied with respect to extent, causes, effects, and methods of dealing with them. Special attention is given to the functioning of Federal-State Social Security in rural society and recent developments are reviewed. Mr. Mayo.

Rural Soc. 534. (Same as Hist. 534.) Farmer's Movements. 0-0-3

The origin, growth, and present status of such national farmers' organizations and movements as the Grange, the Farmers' Alliance, the Populist Revolt, the Farmers' Union, the Farm Bureau, the Society of Equity, the Non-partisan League and co-operative marketing. Mr. Noblin.

Rural Soc. 551, 552. Statistical Analysis of Social Data. 3-3-0

Prerequisite: Stat. 512.

Applications of statistical theory to special problems in sociological research. Mr. Hamilton.

Courses for Graduates Only

Rural Soc. 631. Population Analysis. 0-0-5

Prerequisites: Rural Sociology 411, 551, 552.

Sources and characteristics of population data, problems in population data analysis, and a critical survey of important analytical studies and periodicals in the field. Mr. Hamilton.

Rural Soc. 632. The Rural Family. 0-3-0

Historical forms and functions of rural family life; family activities and relationships; stages of family growth; the family-sized farm; effects of technical and economic changes on the rural family; national policies. Mr. Green.

Rural Soc. 633. The Rural Community. 0-0-3

Human ecology; types of communities; historical trends; economic, cultural and psychological factors; solidarity and disorganization; special interest groups; service agencies; state and national relations; "Utopian" experiments; planning. Mr. Mayo.

Rural Soc. 641. Research in Rural Sociology. Credits by arrangement

Objectives of research; the scientific method; planning; organization, and direction of rural studies; preparation of schedules, interviewing, editing, tabulation, and analysis; field experience; preparation of research reports.

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

Rural Soc. 652. Comparative Rural Societies. 0-3-0

Sociological analysis of rural societies around the world with particular reference to North and South America. In these societies special emphasis is given to their cultural and physical setting, population composition, levels of living, relations of the people to the land, structure and function of the major institutions, and forces making for change. Mr. Mayo.

Rural Soc. 653. Theory and Development of Rural Sociology. 0-0-3

History of the field; theories and contributions of leading sociologists; critical review of current literature; preparation of outlines on specific subjects. Mr. Hamilton.

Rural Soc. 663. Social Aspects of Agricultural Programs. 0-0-3

The study of agricultural programs as implemented by organizations in dynamic relation with the people whom they serve. The course considers the relation of agricultural programs to the social structure and forces in rural society, the problems of coordinating different types of programs, the problem of professional leadership, and problems of stimulating local leadership and participation. Mr. Lowry.

Rural Soc. 671. Seminar. Credits by arrangement

Review of current publications; student research papers; progress reports on departmental research; discussion of research methods and plans; reports from scientific meetings and conferences.

A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

SOCIAL STUDIES

S. S. 101, 102, 103. Contemporary Civilization. 3-3-3

Required of all freshmen in the Schools of Engineering, Design and Forestry; elective for other students with approval of the Department.

This course is an introduction to the humanities and social sciences for technical students. The central study undertaken concerns the relationships existing between scientific-technological development and the ideas, habits, and tastes of our society. A fairly detailed comparison is made between an essentially agrarian and non-industrial society (Europe during the Middle Ages) and our own predominantly urban and industrial civilization. Special attention is given to scientific method and its applicability to the fields of social and humane knowledge. Staff.

S. S. 113. Contemporary Science and Society. 0-3-0

Prerequisites: S. S. 101, 102, 103.

Required of all second year students in the School of Design.

A study of the influence of certain basic scientific concepts, particularly in physics and biology, on social and aesthetic thought. Staff.

S. S. 301, 302. Makers of Western Thought. 3-3-0

A study of the systematic philosophers who have most significantly influenced modern thought, with particular attention to the contributions of empiricism to the scientific method, the concepts of democracy, and the development of humane standards of value. Staff.

S. S. 392, 393. Contemporary Problems. 3-3-0 or 0-3-3

Prerequisites: For engineering students, completion of all preceding Humanities requirements. For others, permission of the department.

Required of seniors in the School of Engineering.

The final course in the humanistic-social program taken by engineering students. Here the resources of the student's scientific and technological training as well as his studies in the humanities and social sciences will be unified and brought to bear on an analysis of the more pressing problems of modern civilization. Staff.

SOCIOLOGY

Courses for Undergraduates

Soc. 101, 102, 103. Peoples of the World. 2-2-2

Designed for students who do not take Military Science. Elective for others.

A discussion of the location, resources, and social organization of the major peoples of the world. Mr. Rawls.

Soc. 202. General Sociology—Man and Society. 3 or 3 or 3

The basic principles underlying social life and the factors connected with it. Messrs. Rawls, Johnson.

Soc. 203. General Sociology-Social Problems. 3 or 3 or 3

Prerequisite: Soc. 202 or equivalent.

An analysis of modern social problems together with the techniques used in dealing with them. Mr. Johnson.

Soc. 205. Cultural Sociology. 3 credits

The course has been developed to meet the demands for a course of the second year level which will lay the basis for an understanding of society and of human behavior, approaching these from the cultural point of view. Mr. Winston.

Soc. 211, 212, 213. General Anthropology. 2-2-2

An introduction to the study of man; a consideration of his physical and cultural development from earliest forms to the present.

Messrs. Rawls, Johnson.

Soc. 301. Human Behavior. 3 credits

Prerequisite: Soc. 202.

An analysis of the social and cultural factors which affect the behavior of persons in their social life. Messrs. Winston, Rawls.

Soc. 343. Human Relations in Industrial Society. 3 or 3 or 3

For students in the School of Engineering. Elective for other students with the approval of the Department.

The course deals with the important social changes and the outstanding social and personal problems in an industrial society. Staff.

Soc. 412. Introduction to the Field of Social Work. 3 credits

Prerequisite: Soc. 202 and permission of the instructor.

An introductory course, designed to acquaint students with the various types of public and private social work and with remedial and preventive programs in relation to applied sociology, social psychiatry, health, welfare and recreation. Mr. Winston.

Soc. 303. Criminology. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Causes and conditions leading to crime; methods of handling criminals; various factors producing criminal behavior. Mr. Johnson.

Soc. 304. The American Family. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Premarital, marital, and family relations; effects of present-day social changes; various efforts to stabilize the family.

Messrs. Winston, Johnson.

Soc. 305. Race Relations. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Elective.

Race problems in America and in other countries; social, economic, and educational status of racial groups; international relations.

Mr. Winston.

Soc. 401. Social Pathology. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Pathological problems arising from social life; social and individual adjustments. Messrs. Winston, Johnson.

Soc. 402. Sociology of City Life. 3 credits

Prerequisites: Soc. 202 or Soc. 343, supplemented by credits in related fields.

Elective.

Problems arising from growth of modern town and city life; city planning in regard to social and industrial progress.

Messrs. Winston, Johnson.

Soc. 404. Educational Sociology. 3 credits

Prerequisite: nine term credits in the Social Sciences.

Application of the principles of Sociology to the practical problems of education with emphasis placed on the relation between adjustment processes in the school and in the larger social world. Mr. Winston.

Soc. 410. Industrial Sociology. 3 credits

Prerequisite: Soc. 202 or Soc. 343, supplemented by credits in related fields.

Influence of industrial life; occupations as social and industrial factors; problems arising from our industrial era. Messrs. Winston, Johnson.

Soc. 421. American Community Relationships. 3 credits

Prerequisite: Nine term credits in Sociology, including Soc. 202.

A survey of the institutions, organizations, and agencies to be found in the modern American community, the social conditions or problems, such as recreation, health, welfare, etc. with which they deal; their inter-relationships and the trend toward overall planning. Mr. Rawls.

Courses for Graduates and Advanced Undergraduates

Soc. 501. Leadership. 3 credits

Prerequisite: nine term credits in Sociology, including Sociology 202.

A study of leadership in various fields of American life: analysis of the various factors, inherent or acquired, that are associated with leadership, past and present. Mr. Winston.

Soc. 502. Juvenile Delinquency. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Analysis of the factors which produce antisocial and delinquent behavior, followed by a study of the various methods of treatment, with emphasis on prevention. Mr. Winston.

Soc. 503. American Culture. 3 credits

Prerequisites: Soc. 202 or Soc. 210, supplemented by credits in related fields.

Analysis of present-day culture, with particular reference to the United States and its regional variations. Mr. Winston.

Soc. 504. The American People. 3 credits

Prerequisite: Soc. 202, supplemented by credits in related fields.

Analyses of crucial problems connected with the growth and decline of populations in the United States; factors connected with birth and death rates; marriage rates; discussion of the changing quality of population groups. Messrs. Winston, Johnson.

Soc. 515, 516, 517. Research in Applied Sociology. 3-3-3

Prerequisite: nine term credits in Sociology, and permission of the instructor.

Individual research problems in applied fields of sociology, such as problems of the family, of population, of social work; rural-urban relations; student success; American leadership. Staff.

STATISTICS

Stat. 301. Statistical Laboratory. 1 or 1-0

Co-requisite: Stat. 361.

This course is based on the numerical work assigned in Stat. 361, which it is intended to accompany. It provides training in the use of electric desk calculating machines in statistical computations. Staff.

Stat. 302. Statistical Laboratory. 0-1-0

A survey of the use of conventional IBM punch card machines with special emphasis on gathering data for punch cards, coding, designing card fields, and the operation of the punch, verifier, sorter and basic wiring techniques for the operation of the tabulator. Mr. Verlinden.

Stat. 303. Statistical Laboratory. 0-0-1

Prerequisite: Stat. 302.

Advanced wiring techniques for the tabulator, the operation and wiring techniques of the collator, reproducer-summary punch, multiplying punch, and the programming of those large scale computations found in statistics. Mr. Verlinden.

Stat. 311. Introduction to Statistics. 4-0-0

Basic concepts and methods of statistics, interpretation of measurements subject to error, description of types of data; purposes, preparation and summarization of data. Mr. McVay.

Stat. 311. Introduction to Statistics (Forestry Section). 0-0-4

(Same as above.) Mr. Monroe.

Stat. 361. Introduction to Statistics for Engineers. 3 or 3-0

Prerequisites: College algebra and an elementary science course.

Same as 311 except that the laboratory is optional. Engineering examples will be used and some Quality Control will be added.

Students are urged, though not required, to take Stat. 301 concurrently. Mr. Hader.

Courses for Graduates and Advanced Undergraduates

Stat. 512. Basic Experimental Statistics. 4 or 4-0

Prerequisites: Stat. 311 and one term of college mathematics, or consent of instructor.

Basic concepts of statistical models and use of samples; variability in sample data; distributions; estimation of parameters; simple test of significance: t-test, analysis of variance, chi-square tests.

Messrs. Robinson, Lucas.

Stat. 513. Experimental Statistics for Biological Sciences. 0-4 or 4

Prerequisite: Stat. 512.

Extension of basic concepts to biological experiments; computing techniques, more complicated analyses such as covariance, multiple regression, multiple covariance, analysis of variance with multiple classifications; computation and application of single degrees of freedom. Mr. Monroe.

Stat. 521. Applied Mathematical Statistics I. 4-0-0

Prerequisite: Undergraduate calculus.

Probability, frequency distribution, moments, sampling distributions.

Mr. Smith.

Stat. 522. Applied Mathematical Statistics II. 0-4-0

Prerequisite: Stat. 521.

General theory of estimation and tests of significance, non-parametric tests. Mr. Smith.

Stat. 523. Applied Mathematical Statistics III. 0-0-4

Prerequisite: Stat. 522.

Least squares—multiple regression, analysis of variance and covariance, and variance components. Mr. Smith.

Stat. 531. Design of Experiments. 3-0 or 3

Prerequisites: Stat. 513 or Stat. 523 or Stat. 543.

Fundamental principles of designs; randomized blocks and Latin squares; treatment components; experimental and sampling errors, components of error, confounding; factorial, split-plot, and incomplete block designs.

Mr. Anderson.

Stat. 532. Sample Survey Designs. 0-3-0

Prerequisite: Stat. 311.

Description of survey designs involving simple random, stratified and systematic samples; subsampling, quota, list and area sampling; expansion factors; sampling errors in a finite population. Discussion of designs for specific surveys. Mr. Finkner.

Stat. 543. Experimental Statistics for Social Sciences. 0-0-4

Prerequisite: Stat. 512.

Extension of basic concepts to social experiments; use of index numbers; contingency tables; multiple regression and analysis of variance for time series data; orthogonal polynomials. Mr. McVay.

Stat. 551, 552. Statistical Analysis of Social Data. 3-3-0

Applications of statistical theory to special problems in sociological research. Mr. Hamilton.

Stat. 561, 562, 563. Experimental Statistics for Engineers. 3-3-3

Prerequisite: Stat. 361. Probability and Calculus are desirable.

Methods for the interpretation of data in engineering and the physical sciences. Applications of the theory of errors to experimental data, standard tests of significance, essentials of the theory of estimation, and analysis of variance and covariance, with an introduction to correlation and regression. Introduction to the efficient design of experiments.

Mr. Hader.

Courses for Graduates Only

Stat. 611, 612, 613. Special Problems. 1-3, 1-3, 1-3

Development of techniques for specialized cases, particularly in connection with thesis problems. Staff.

Stat. 615. Research Methods in Plant Science 3-0-0

Prerequisite: Stat. 513.

Techniques of establishing and maintaining field and greenhouse experiments, size, shape and orientation of plots, border effects, estimation of experimental material required for specified accuracy, subsampling plots for yields and laboratory analyses. Mr. Rigney.

Stat. 621. Statistics in Animal Science. 0-0-3

Prerequisite: Stat. 512 or Stat. 522.

Co-requisite: Stat. 513 unless have had Stat. 522.

Sources and magnitudes of errors in experiments with animals, experimental designs adapted for specific types of animal research, amount of data required for specified accuracy, factors involved in the increase of accuracy at minimum cost. Mr. Lucas.

Stat. 625, 626. Statistical Concepts in Genetics. 0-3-3

(626 in alternate years, not to be offered in 1953.)

Prerequisites: Stat. 512 or Stat. 522 and Gen. 512 unless taken concurrently.

The composition of phenotypic variance and the estimation of environmental, genetic, and heritable genetic variance. The effects of various selection procedures and systems of breeding on population means and variances. Mr. Comstock.

Stat. 631. Theory of Sampling Applied to Survey Design. 0-0-3

Prerequisite: Stat. 513 or 523.

Basic theory of sampling from a finite population. Confidence limits and estimation of optimum sample size. Comparison of simple random, stratified, quota, purposive, and systematic sample. Choice of sampling unit. Subsampling. Relative efficiencies of different methods of estimation. Double sampling. Discussion of unique applications of sampling theory.

Mr. Finkner.

Stat. 642. Advanced Design of Experiments. 0-3-0

Prerequisites: Stat. 531 and 523.

Construction and use of designs—confounding, quasi-factorial, incomplete blocks and lattice square designs, methods of analysis. Survey of types of designs available. Long time and groups of experiments. Miss Cox.

Stat. 645, 646, 647. Advanced Experimental Statistics for Engineers. 3-3-3

Prerequisites: Stat. 563, advanced Calculus, Matrix Algebra (Calculus or matrix algebra may be taken concurrently).

Extension of courses Stat. 561-2-3 to include methods applicable to exceptional cases, and to the design of complex experiments. Study of assumptions underlying statistical techniques, and consequences when assumptions are not satisfied. Recent results.

Stat. 651. Statistical Techniques in Agricultural Economics. 3-0-0

Prerequisite: Stat. 543 or Stat. 523.

Analysis of variance with disproportionate frequencies; variance components; designing experiments or surveys to estimate reationships; introduction to multi-equation regression methods. Mr. Anderson.

Stat. 652, 653. Econometric Methods. 0-3-3

Prerequisites: Stat. 651 and Stat. 523.

Formulation of econometric models; estimation of parameters; multivariate analysis; multi-equation methods; linear programming; time series analysis; serial correlation. Mr. Anderson.

Stat. 661, 662. Applied Multivariate Analysis. 4-4-0

Prerequisites: Stat. 513 (Also analytic geometry and the elementary properties of determinants.)

The general multivariate model for experimental work, relations between multiple regression, analysis of variance and multivariate analysis, factor analysis, the generalized variance, the generalized Student ratio, intra-class correlations, testing compound symmetry between two sample covariance matrices, scale analysis, cannonical correlation, testing for the rank of a correlation matrix. Mr. Nicholson.

Stat. 663. Special Problems in Multivariate Analysis. 0-(3 or 5)-0

Prerequisite: Stat. 661 or permission of instructor.

A seminar course devoted to special problems in applied multivariate analysis particularly designed for advancing the use of these methods in specific research problems. Staff.

Stat. 664. Psychological Aspects of Factor Analysis. 0-0-4

Prerequisite: Stat. 661 or permission of instructor.

History of factor analysis, theory of two-factors, fictitious factors, hierarchal order, need of group factors, the centroid method, communalities, common factor space, estimation of factors, orthogonal and oblique factors, the problem of rotation, simple structure, second order factors.

Mr. Thurstone.

Stat. 675, 676. Advanced Experimental Statistics. 3-3-0
Prerequisite: Stat. 523.
Regression analysis with errors in both variates; orthogonal polynomials; principles of constructing experimental models; effects of inadequacies in the models; variance components; discriminant functions; uses of chi-square; methods of combining data with heterogenous errors; methods of transforming data to meet specific objectives. Mr. Anderson.

Stat. 681. Seminar. 1-1-1
A maximum of three credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

Stat. 691. Research. Credits by arrangement
A maximum of nine credits is allowed toward the Master's degree; no limitation on credits in Doctorate programs. Staff.

SCHOOL OF TEXTILES

Courses for Undergraduates

Tex. 108. Yarn Principles. 3 or 3 or 3
Required of freshmen in all Textile curricula.
This course is an introduction to textile manufacturing. It covers briefly the processes common to yarn manufacturing, and in a broader sense the types of mechanisms common to all textile machines, calculations involving speeds, productions, and twists that are associated with these mechanisms, and the theory and application of the cotton numbering system. The lecture and recitation work are supplemented by laboratory application, which covers in detail the work of the classroom. Messrs. Bunn, Parker, Stuckey.

Tex. 131. Fabric Principles. 3 or 3 or 3
Required of freshmen in all Textile curricula.
An introduction to the study of fabric development and construction. The methods of preparing yarn for weaving, the weaving of fabrics, and the calculations required to produce a fabric are included. Lectures are supplemented by laboratory exercises in operation of the machinery.
Messrs. Whittier, Gaither.

Tex. 203. Textile Yarns. 0-0-3
Prerequisite: Tex. 108.
Required of sophomores in Textile Chemistry.
A condensed study of the processing of spun yarns, with emphasis on the characteristics of spun yarn and the packaging of the yarn for dye work. Class-room and laboratory studies. Messrs. Bunn, Parker, Smith.

Tex. 206, 207. Yarn Manufacture II. 3-3-0 or 0-3-3
Prerequisite: Tex. 108.
Required of sophomores in Textiles.
Combined lecture and laboratory instruction on the functions involved in processing textile fibers on the cotton system from the raw product to the

spun yarn. Particular emphasis is given to a study of the functions of opening, cleaning, doubling, evening, and drafting.

Messrs. Bunn, Parker, Smith.

Tex. 217. Survey of Textile Industries. 0-0-3

Required of students majoring in Industrial and Rural Recreation.

A broad description of the manufacturing processes common to spinning, weaving, throwing, knitting and finishing with special emphasis placed on the orientation of personnel within these plants. Lectures will be supplemented with tours of school laboratories and specialized visual aids.

Mr. Dunlap.

Tex. 233, 234. Weaving II. 2-2-0 or 0-2-2

Prerequisite: Tex. 131.

Required of sophomores in Textiles.

A study of cam loom mechanisms; cams and their construction; timings, settings and operation of plain cam and drop-box looms.

Messrs. Moser, Gaither, Berry.

Tex. 237. Fabric Structure. 2 or 2 or 2

Prerequisite: Tex. 131.

Required of Sophomores in Textiles.

A study of the fundamental principles of fabric structure. Special emphasis is placed on the weave formation, drawing in draft, and cam design of basic fabrics, such as plain woven grey goods, twills, sateens, and their common derivatives. Messrs. Gaither, Davis, Berry.

Tex. 261. Knitting I. 2 or 2 or 2

Tex. 267, 268, 269. Knitting Laboratory I. 1-1-1

Required of sophomores in Textiles. Selection and preparation of knitting yarns, knitting mechanisms, structure of selected types of spring and latch needle fabrics; operation and adjustment of the basic types of knitting machines. Messrs. Lewis, Harrill.

Tex. 307, 308. Yarn Manufacture III. 3-0-3 or 0-3-3

Prerequisites: Tex. 206, 207.

Required of juniors in Textiles.

A continuation of Yarn Manufacture II on the functions of twisting and packaging of cotton rovings and yarns, with laboratory work supplementing lecture instruction. Also included is a study of textile machines as producing units—such machines as combers, roving frames, twisters, and the like.

Messrs. Hilton, Bunn, Smith.

Tex. 316. Textile Testing I. 3 or 3 or 3

Required of juniors in Textiles.

Quality control methods for textile processing, with emphasis on the measurement by laboratory instruments and techniques, and including a study of the mechanical and natural influences involved.

Messrs. Grover, Hamby, Stuckey.

Tex. 318. Upholstery Fabrics. 3-0-0

Required of juniors in Furniture Manufacturing.

A study of the basic principles of fabric structure and identification. A complete description of fabrics particularly suited to the furniture trade, including nomenclature, economic importance, physical properties, and price structure. Messrs. Whittier, Gaither.

Tex. 335, 336. Weaving III. 3-3-0

Prerequisites: Tex. 233, 234.

Required of juniors in Textiles.

Methods of drawing-in and starting up dobby warps; setting of harness shafts; selection of springs or spring jacks. Construction and setting of drop-box motions, single and double index dobbies and automatic mechanisms; methods of fixing looms.

Preparation of warps for weaving fabrics on dobby looms; starting up warps in looms; pattern chain building; operation of dobby looms.

Messrs. Moser, Berry.

Tex. 341. Dobby Design I. 0-3-0

Prerequisite: Tex. 237.

Required of Juniors in Textiles.

A study of basic dobby weaves and their drawing in drafts, chain and reed plans. This course includes the development of such weaves as ribs, spot designs, fancy twills, honeycombs, piques, warp and filling back weaves and their application to styled fabrics. Messrs. Moser, Gaither, Berry.

Tex. 342. Fabric Analysis I. 0-0-3

Prerequisite: Tex. 341.

Required of juniors in Textiles.

Instruction in fabric analysis technique and use of laboratory instruments for determination of fabric construction details. The development of fabric specifications and design is stressed.

Messrs. Moser, Gaither, Davis.

Tex. 345. Fabric Technology. 3 or 3 or 3

Prerequisite: Tex. 237.

Required of seniors in Weaving and Designing and General Textiles Options.

Calculations for contraction and factors which affect it; average yarn count; cloth constant, percentages of warp, filling and sizing; ascertaining the counts of warp and filling required for a given weight and construction; checking the correctness of any given yarn combination; obtaining spun counts from sized yarns; calculating yarn to be spun for a specific order; allocation of looms; loom speeds and production. Mr. Hart.

Tex. 371, 372. Knitted Fabric Design and Analysis. 2-2-0

Prerequisites: Tex. 261, 269.

Required of students in Knitting Option. Elective for others.

Stitch formation for the more intricate knitted fabrics; control mechanisms for pattern work; designing methods; analysis of fabrics for reproduction and costing; color in knit goods. Mr. Lewis.

Tex. 404, 405. Synthetic Fiber Processing. 3-3-0 or 0-3-3

Prerequisites: Tex. 307, 308.

Required of seniors in Yarn Manufacturing and Synthetic Options.

Elective for others.

Studies of the contributions of individual fibers to the entire blend covering both the man-made as well as natural fibers. Processing of man-made fibers into spun yarn and fabric, particularly on the cotton system. The processing of man-made fibers by new methods, such as by direct spinning and the Pacific Converter. Studies of the modification of machines for processing synthetic fibers alone or in blend with other fibers.

Messrs. Grover, Hamby.

Tex. 407, 408. Yarn Manufacture IV. 3-3-0

Prerequisites: Yarn Manufacture III, Tex. 307, 308.

Required of seniors in Yarn Manufacturing and General Textiles Options. Elective for others.

Co-ordinated studies of the manufacture of yarn in the classroom and laboratory. Machine layout and sequence, draft limits, modern machines and processes, labor requirements, speeds, productions, and special related aspects are all combined to give an overall knowledge of yarn manufacture. Laboratory exercises involve processing from bale to packaged yarn.

Mr. Hilton.

Tex. 411, 412. Testing and Quality Control. 4-4-0

Prerequisite: Tex. 316.

Required of students in Quality Control Option. Elective for others.

Fiber, yarn, and fabric testing on natural and man-made fibers with special emphasis on cotton and wool, and man-made fibers in current production. A study of advanced testing techniques for staple and filament yarns and fabrics, including quality control programs such as "defect preventative" methods and pin-pointing of trouble. Technical report writing, library work, and relationship between a quality control department and operating divisions. Study of Military Specifications and U. S. Government Standards such as CCC-T191b. Attendance at technical meetings, such as The Fiber Society, A.S.T.M., A.S.Q.C., etc. Messrs. Grover, Hamby.

Tex. 414, 415. Development Project. 0-2-2

Prerequisite: Tex. 411.

Required of students in Quality Control Option.

Studies are conducted independently on assigned problems, and seminars are held on applications and administration of testing, quality control, and development. Studies and discussion of budgeting and evaluation of priority and progress. Current technical developments are discussed. Results of project to be written in form of a technical report from a control and development laboratory. Staff.

Tex. 416. Wool Manufacture I. 3 or 3 or 3

Prerequisites: Tex. 206, 207.

Required of Seniors in Yarn Manufacturing and Synthetics Options. Elective for others.

Raw materials used in wool and worsted trades; classification, structure, and characteristics of fibers, grading, sorting and mixing. Reclaimed wool and secondary raw materials. Lectures are supplemented by laboratory applications. Mr. Hilton.

Tex. 420. Fiber Quality I. 0-3-0

Required of juniors in Textiles and Textile Chemistry.

History, development, production, ginning and handling of cotton. World crops; marketing methods; classification; relation of grade and staple to the value of cotton. Measurement of the physical properties of cotton fibers and their relation to spinning quality; relation of grade and staple to waste, spinning behavior, and yarn quality. Selection of cotton for different types of yarns and fabrics. Mr. Campbell.

Tex. 421. Fiber Quality II. 3-0-0 or 0-0-3

Required of juniors in Textiles.

An introduction to synthetic fiber knowledge, including the history, development, and classification of all synthetic fibers. A study of the manufacturing processes of synthetic yarns. A description of the chemical and physical properties of the fibers and yarns and how these affect the selection of synthetic yarns and fabrics by consumers.

Messrs. Rutherford, Whittier.

Tex. 424. Yarn Technology. 0-3-0 or 0-0-3

Prerequisites: Tex. 307, 308.

Required of seniors in Yarn Manufacturing and Synthetics Option. Elective for others.

A summary of the calculations involved in the production of yarn. The effect of staple, quality, twist, and fiber size and distribution on yarn characteristics. Novelty yarns. The technological aspects of blending different synthetics together or with natural fibers. Production of sewing thread.

Mr. Hilton.

Tex. 426, 427. Mill Organization. 0-3-3

Prerequisites: Tex. 307, 308; Tex. 341, 342.

Required of seniors in Textiles.

Studies of organizations of textile mills from personnel as well as functional viewpoints and of the planning and scheduling of manufacturing contracts through opening and weaving mills. Analysis of manufacturing organizations based on processes and equipment. Mr. Grover.

Tex. 437. Weaving Laboratory IV. 2 or 2-0

Prerequisites: Tex. 335, 336.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

Operation and fixing of dobby, pick and pick, and jacquard looms; preparation of warps to weave rayon, wool and fine cotton fabrics; building of box, dobby and multiplier chains. Mr. Moser.

Tex. 438. Weaving Laboratory V. 0-2-0 or 0-0-2

Prerequisites: Tex. 335, 336.

Required of seniors in Weaving and Designing Option.

Continuation of Tex. 437 with special emphasis upon making original designs for dobby fabrics, preparing the warps and weaving the fabrics.

Mr. Moser.

Tex. 439. Pile Fabrics. 0-0-3

Prerequisite: Tex. 437.

Elective.

A study of single shuttle and double shuttle pile fabric such as terry cloth, corduroy, plush, and carpet fabrics. This will include the fabric structure, yarn preparation, weaving, and finishing aspects of pile fabrics woven on cam, dobby, and jacquard looms. Mr. Berry.

Tex. 443. Dobby Design II. 3-0-0

Prerequisite: Tex. 341.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

A detailed study of the design and weave of complicated fabrics such as double cloth, corduroy, velveteen, crepe and intricate figured designs, matellasse, velvet and frieze. Staff.

Tex. 445. Jacquard Design. 0-3-0

Prerequisite: Tex. 341.

Required of seniors in Weaving and Designing Option. Elective for others.

Designing fancy and jacquard fabrics; methods of making original designs for table napkins, table cloths, dress goods, draperies. Mr. Berry.

Tex. 451. Fabric Analysis II. 2-0-0

Prerequisite: Tex. 342.

Required of seniors in General Textiles and Weaving and Designing Options. Elective for others.

Analyzing samples of cotton, wool, worsted, linen, rayon, and silk fabrics for size of yarns, ends and picks per inch, weight of warp and filling, so as to accurately reproduce samples analyzed; obtaining design, drawing in draft, chain, and reed plan for fancy fabrics, such as stripes, checks, extra warp and extra filling figures, leno fabrics, jacquard fabrics, draperies.

Staff.

Tex. 452. Fabric Characteristics. 0-3 or 3

Prerequisite: Tex. 341, 342.

Elective.

A study of the identification, classification, and utilization of woven fabrics and how these are affected by various properties such as geometry, weave, and finish. Actual inspection of a wide range of fabrics with emphasis on a study of defects and their influence on quality will be included in the laboratory work. Mr. Whittier.

Tex. 455. Color in Woven Design. **3 or 3 or 3**

Prerequisite: Tex. 341.

Required of seniors in Weaving and Designing Option. Elective for others.

Pigment and light theories of color; contrast and harmony of colors; factors which influence quality, style, and color; methods of applying weaves and color to fabrics for wearing apparel and home decorations. Mr. Hart.

Tex. 460. Knitting Mechanics. 0-3-0

Prerequisites: Tex. 261, 269.

Mathematics and mechanics of flat and rib knitting.

Inter-relation of yarn number, yarn diameter, gauge, cut, stitch, length, fabric structure, and weight; proportions of yarns in multiple-thread work; production problems, etc. Mr. Shinn.

Tex. 463, 464, 465. Knitted Garment Laboratory. 2-2-2

Prerequisites: Tex. 261, 269.

Required of students in Knitting Option. Elective for others.

A study of circular latch needle and spring needle machines for knit fabric production styling, cutting and seaming of the basic garment types for underwear and outerwear; standard seam types; high-speed sewing machines. Messrs. Shinn, Lewis.

Tex. 468. Flat Knitting. 3-0-0

Prerequisites: Tex. 261, 269.

Required of seniors in Knitting Option. Elective for others.

A study of the leading types of flat knitting machines including warp knitting machines, design possibilities, and fabric adaptability. Mr. Shinn.

Tex. 469. Tricot Knitting. 0-0-3

Prerequisites: Tex. 261, 269.

Required of seniors in Knitting Option. Elective for others.

A study of basic types of tricot knitting machines with emphasis on mechanisms and fabrics. Attention is given to warp preparation methods applicable to the tricot machine, the characteristics of yarns made from natural and synthetic fibers as they affect processing into warp knitted fabrics, machine settings for proper qualities and ratios; economics of warp knitting, and end uses. Attention is given to fabric design and analysis. Mr. Shinn.

Tex. 471. Full-fashioned Hosiery Manufacture. 0-0-2

Tex. 473, 474, 475. Knitting Laboratory III. 2-2-2

Prerequisites: Tex. 261, 269.

Required of seniors in Knitting Option. Elective for others.

Mechanics of the full-fashioned hosiery machine including practical training in its adjustment and operation. Attention is given to yarn preparation, knitting, inspection, finishing and packaging hosiery. Mr. Shinn.

Tex. 470. Textile Cost Methods. 3 or 3 or 3

Prerequisites: Tex. 307, 308; Tex. 341, 342.

Required of seniors in Textiles except those in Management Option.

A survey of cost methods applicable to textile mills with emphasis on calculations, the preparation of cost reports, and their use in cost control.
Mr. Shinn.

Tex. 477. Hosiery Manufacture. 3 or 3 or 3

Prerequisites: Tex. 261, 269.

Required of seniors in Textiles.

A study of advanced types of circular knitting machines and the problems involved in the manufacture of the more complex types of hosiery. Hosiery design and analysis. Mr. Harrill.

Tex. 490. Synthetics I. 3 or 3 or 3

Prerequisite: Tex. 421.

Required of students in General Textiles and Yarn Manufacturing options.

A general course including: textile processing of continuous filament synthetic yarns in the yarn producing plants; preparation of yarns for weaving and knitting including crepe, voile and hosiery yarns; the application of synthetic yarns for use as industrial yarns and fabrics; also, calculations involving the denier system and production calculations.
Messrs. Grover, Hamby.

Tex. 491, 492, 493. Synthetics II. 3-3-3

Prerequisite: Tex. 421.

Required of students in Synthetic Option.

Advanced study of synthetic yarn properties and handling methods. Comprehensive study of sized and unsized warp preparation, twisting, weaving, filling yarn preparation, cloth grading, tricot warp preparation, and single end sizing for knitting purposes. Styling and merchandising of synthetic yarn end products. Messrs, Grover, Hamby, Moser.

Courses for Graduates and Advanced Undergraduates

Tex. 509. Textile Testing II. 0-0-3

Prerequisite: Tex. 316, Stat. 361, or graduate standing.

Required of students in Quality Control Option. Elective for others.

The application, evaluation, and interpretation of textile data with special emphasis on quality control charts, reliability of averages, sampling, etc. Study of advanced techniques in evaluation of staple fiber fabrics, including blend evaluation and analysis. A study of laboratory layout, cost of testing and testing equipment, and organization. Messrs. Grover, Hamby.

Tex. 515. Yarn Manufacturing Project. 0-0-3

Prerequisites: Tex. 307, 308.

Required of seniors in Yarn Manufacturing Option.

Setting up an assigned project, processing, testing and analysis of results, together with a written report on all phases is required. Mr. Grover.

Tex. 517. Textile Organization Control. 0-0-3

Prerequisites: Senior Standing, Econ. 302, 325, Tex. 426.

Analysis of actual case problems peculiar to the textile industry covering various management aspects such as organization structure, policy determination, wage incentives, training, mill layout, from the standpoint of the top executive. Mr. Feng.

Tex. 535. Weaving VI. 0-0-3

Prerequisite: Tex. 437.

Required of seniors in Weaving and Designing Option. Elective for others.

Construction of looms, adaptable to weaving the more intricate fabrics of natural and synthetic fibers; pick and pick looms; box and multiplier chain-building; arrangement of colors in boxes to give easy running loom; extra appliances for weaving leno, towel, and other pile fabrics; relative speed of looms; production calculations and fabric costs. Weave room management. Staff.

Tex. 544. Dobby Design III. 0-3-0

Prerequisite: Tex. 443.

Required of seniors in Weaving and Designing Option. Elective for others.

Combination of plain and fancy weaves with leno; methods of obtaining leno patterns; methods of making original designs for dress goods, draperies, etc. Staff.

Tex. 546. Jacquard Design and Weaving. 0-0-3

Prerequisite: Tex. 445.

Required of seniors in Weaving and Designing Option. Elective for others.

Construction and operation of single, double lift, and rise and fall jacquards; tie-up of harness for dress goods, table napkins, damask and other jacquard fabrics such as leno; card cutting, lacing; making original jacquard designs. Mr. Berry.

Tex. 599. Instrumentation and Control. 3 or 3 or 3

Required of all seniors in Textiles and Textile Chemistry.

A lecture series with coordinated laboratory exercises designed to familiarize the student with the theory and application of instruments and control apparatus that he will find in the modern textile plant.

The studies cover the measurement and control of temperature, humidity, regain, chemical processes, physical finishing processes, time and temperature cycles, yarn and cloth tension, speed, and fluid pressure. Mr. Asbill.

Courses for Graduates Only

Tex. 601, 602, 603. Yarn Manufacture. 3-3-3

Prerequisites: Tex. 407, 408 or equivalent.

A study of breaking strength and related properties of cotton yarns made under various atmospheric conditions; comparison of yarns produced from long and short-staple cotton with regular and special carding processes; efficiency of various roller covering materials at the drawing processes; elimination of roving processes by special methods of preparation; comparison of regular and long-draft spinning. Messrs. Grover, Hamby.

Tex. 605, 606, 607. Textile Research. 3-3-3

Problems of specific interest to the textile industry will be assigned for study and investigation. The use of experimental methods will be emphasized. Attention will be given to the preparation of reports for publication. The master's thesis may be based upon the data obtained. Staff.

Tex. 609. Textile Testing III. 0-3-0 or 0-0-3

Prerequisites: Tex. 509.

Design of textile laboratories, including conditioning equipment and instruments required for specific needs; performance of tests and analysis of data on industrial problems; specialized physical tests; inter-laboratory tests and analysis; study of A.S.T.M. specifications and work on task groups for the A.S.T.M. Society. Messrs. Grover, Hamby.

Tex. 611. Synthetics IV. 0-0-3

Prerequisites: Tex. 491, 492.

Setting up of an assigned project on problems peculiar to the processing of continuous filament yarns, particularly in the initial preparatory stages of processing, and including sizing, twisting, winding, and associated problems. Messrs. Grover, Hamby.

Tex. 631, 632, 633. Textile Design and Weaving. 3-3-3

Prerequisites: Tex. 443, 544, or equivalent.

Study and practice in more advanced designing and analysis of fabrics, such as lenos made with twine and wire doups, lappits, and other fancy fabrics; designing for jacquard dress goods, table covers, reversibles, and other fabrics; making original designs for dobby and jacquard fabrics; fabric costs; weaving fancy and jacquard fabrics. **Staff.**

Tex. 635, 636, 637. Seminar. 1-1-1

Discussion of scientific articles of interest to textile industry; review and discussion of student papers and research problems. **Staff.**

Tex. 661, 662, 663. Knitting Research. 3-3-3

Prerequisites: Graduate standing and 12 credits in knitting.

Problems of specific interest to the knitting industry will be assigned for study and investigation. The use of experimental methods will be emphasized. Attention will be given to the preparation of reports for publication. Staff.

TEXTILE CHEMISTRY

Courses for Undergraduates

TC301, 302, 303. Textile Chemistry I. 3-3-3

Prerequisite: Chem. 105.

Required of all textile students except those majoring in Textile Chemistry.

A comprehensive course covering: a brief outline of the chemical properties of fibers; a study of important plant processes and machinery involved in the wet handling of textiles.

Two 1-hour lectures and 2 hours of laboratory work per week.

Mr. Hayes.

TC305, 306, 307. Textile Chemistry II. 4-4-4

Prerequisite: Concurrent enrollment in Chem. 421.

Required of all students majoring in Textile Chemistry.

A study of the chemistry of natural fibers; action of chemicals on fibers; methods and chemistry of scouring, bleaching, and mercerization; preparation of dyestuffs and their application to fibers.

Two 1-hour lectures and 4 hours of laboratory work per week.

Mr. Hayes.

TC405, 406, 407. Textile Chemistry III. 4-4-4

Prerequisite: TC307.

Required of all students in Textile Chemistry.

A continuation of TC305, 306 and 307 with special emphasis on modern dyeing methods. Laboratory exercises and use of pilot and mill-scale equipment of many types in dyeing all important fibers and fiber mixtures. Selected topics of importance to the textile chemist with special attention to current technological advances in the field. Visits to mills selected to cover a wide variety of processing techniques.

Two 1-hour lectures and one 4-hour laboratory per week.

Mr. Campbell.

TC408. Fabric Finishing I. 3 or 3 or 3

Prerequisite: TC303.

Required of seniors in Synthetics Option. Elective for others.

A brief course in the application of finishes to fabrics. Outlined to meet the needs of general textile students with little emphasis on the chemistry of finishing compounds. Lectures accompanied by demonstrations.

Three 1-hour lectures per week. Messrs. Rutherford, Davis.

TC409. Fabric Finishing II. 0-0-4

Prerequisite: TC307.

Required of students in Textile Chemistry.

A study of the compounds used in the finishing of fabrics, and of the methods used in laboratory development and plant application of finishing compounds. Studies of the methods of evaluation of finishes are included in the laboratory work.

Two 1-hour lectures and one 4-hour laboratory period per week.

Mr. Rutherford.

TC410. Textile Microscopy. 2 or 2 or 2

Prerequisites: Tex. 420, 421. These courses may be taken concurrently.

Required of all textile students.

Lectures, demonstrations and experiments in the use of the microscope; preparation of slides; fiber identification; examination of yarns and fabrics. Fundamentals and applications of the polarizing microscope. Photomicrography. Micrometry. Phase and electron microscopy.

Two 2-hour laboratory periods per week. Mr. Davis.

TC411. Textile Chemical Analysis A. 3-0-0

Prerequisites: Chem. 212, TC307.

Elective for students in Textile Chemistry.

Analysis of known textile chemicals and related materials such as water, soap, wetting agents, synthetics detergents, bleaching and stripping agents, and finishing compounds. Messrs. Rutherford, Campbell, Davis.

TC412. Textile Chemical Analysis B. 0-3-0

Prerequisites: Chem. 212, TC307.

Elective for students in Textile Chemistry.

Identification and quantitative determination of materials employed in several broad categories of textile wet processing such as sizes, surface active agents, dyestuffs and finishes. Messrs. Rutherford, Campbell, Davis.

TC413. Textile Chemical Analysis C. 0-0-3

Prerequisites: Chem. 212, TC307.

Elective for students in Textile Chemistry.

Analysis of textile materials involving specialized instruments and techniques such as spectrophotometry, flame photometry, surface tension measurements, pH measurements, electrometric titration, viscometry, etc.

Messrs. Rutherford, Campbell, Davis.

TC414, 415. Textile Printing. 0-3-3

Prerequisite: TC307.

Required of students in Textile Chemistry.

Fundamentals of textile printing with major emphasis on modern roller printing methods; design of printing machines, preparation of cloth for printing, formulation and properties of printing pastes, application techniques for all important types of dyestuff, styles of printing, and ageing and aftertreating procedures.

One 1-hour lecture and one 4-hour laboratory period per week.

Mr. Campbell.

Courses for Graduates and Advanced Undergraduates

TC510. Advanced Textile Microscopy. 3 or 3 or 3

Prerequisite: TC410.

Elective.

Study of textile starches, fibers, fabrics. Preparation of permanent slides. Study of various mounting media; methods of cross-sectioning; reagents and stains. Applications of the polarizing microscopy. Photomicrography. Industrial Microscopy, Phase and Electron Microscopy. Staff.

TC520, 521. Chemistry of Fibers. 3-3-0

Prerequisite: TC307 or Chem. 423.

Required of students in Textile Chemistry.

A lecture course emphasizing: the theory of fiber structure; the relationship between the chemical structure and physical properties of fibers; the nature of the chemical reactions which produce degradation of fibers; the production of synthetic fibers. TC520 is devoted to the chemistry of the cellulosic fibers, both natural and regenerated. TC521 deals with the protein fibers and the true synthetics. TC520 is not a prerequisite for TC521 nor vice versa. Students outside the field of Textile Chemistry who may possibly have a choice of either course should take TC520 in preference to TC521.

Three 1-hour lectures per week. Mr. Rutherford.

TC530. Chemical Testing of Textiles. 3 or 3 or 3

Prerequisites: TC303 and Tex. 421.

An elective course for all students in Textiles except those majoring in Textile Chemistry.

The work includes the chemical identification of fibers, the qualitative and quantitative analysis of fiber blends by chemical means, and the evaluation techniques for dyed and finished materials.

One 1-hour lecture and two 2-hour laboratories per week.

Messrs. Rutherford, Campbell.

TC532. Seminar in Textile Chemistry. 0-0-2

Prerequisite: TC405.

Elective for Textile Chemistry students.

The course is designed to familiarize the student with the principal sources of textile chemical literature and to emphasize the importance of keeping abreast of developments in the field of textile chemistry. Particular attention is paid to the fundamentals of technical writing. Reports.

Mr. Campbell, Staff.

Courses for Graduates Only

TC605, 606, 607. Textile Dyeing. 3-3-3

Prerequisite: TC407.

The course consists of matching shades from standard and season color cards upon classes of materials which require skill in their dyeing, such as three-fiber, cotton-wool, and half-silk hosiery, woolens and worsteds with effect stripes, and cotton fabrics with woven figures or stripes of the different varieties of rayon; advanced work on chemical examination of materials used in dyeing and finishing. Theories of dyeing and finishing are also included. Staff.

ZOOLOGY

Courses for Undergraduates

Zool. 101. General Zoology. 4 or 4-0

Animals with special reference to the morphology and physiology of vertebrates, including intensive laboratory study of the mammal with lecture and laboratory work closely integrated and applied to human life.

Mr. Brandt.

Zool. 102. General Zoology. 0-4 or 4

Animals with special reference to economic and ecological considerations designed to give the student a general understanding of animal life and its importance in human affairs. Mr. Brandt.

Zool. 111. Elementary Wildlife Management. 1-0-0

Designed to acquaint the student with the field of Wildlife Management and to outline the training requirements necessary for employment in this profession. Mr. Barkalow.

Courses for Advanced Undergraduates

Zool. 213. Human Physiology. 0-3-0

Prerequisites: Zool. 101.

Human physiology with emphasis on topics which are of special interest to students of recreation. Mr. Evers.

Zool. 223. Comparative Anatomy. 0-5-0

Prerequisites: Zool. 101, 102.

Comparative morphology of vertebrates. Interrelations of organ systems of the various groups. Mr. Harkema.

Zool. 251, 252, 253. Ornithology. 2-2-2

Prerequisite: Zool. 101.

Biology, ecology, and identification of North American birds. One hour of lecture, one two-hour field or laboratory period per week throughout the year. Open any term for elective credit. Mr. Quay.

Zool. 301. Animal Physiology. 5-0-0 or 0-0-5

Prerequisites: Zool. 101, Phys. 215, Chem. 203.

Physiology of vertebrates with particular reference to man and the lower mammals. Principles of function of the various systems are stressed. Mr. Evers.

Zool. 312. Principles of Game Management. 0-3 or 3

Elective for juniors and seniors not majoring in Wildlife.

Designed especially for students who anticipate entering the fields of agriculture, forestry, extension, or rural and industrial recreation.

A study of the major principles involved in game management and the correlation of wildlife management with other land uses. Mr. Barkalow.

Zool. 315. Animal Parasitology. 0-0-4

Prerequisites: Zool. 101, 102.

This course is designed to give students a knowledge and appreciation of the parasitic habit. The biology, life history, pathology, and control of the common parasitic forms of domestic animals and poultry are covered. Mr. Harkema.

Zool. 321. Wildlife Conservation. 0-3-0

History of game and wildlife management; relation of wildlife conservation to soil and forest conservation; national and state parks; and general farming operations. Mr. Barkalow.

Zool. 332. Fur Resources. 0-3-0

Prerequisite: Zool. 101.

Life history and management of the important fur-bearing animals; skinning, drying, marketing pelts; fur farming. Mr. Barkalow.

Zool. 452. Animal Microtechnique. 0-0-3

Prerequisites: Zool. 101, 102; Chem. 203.

The theory and practice of preparing temporary and permanent mounts for microscopic study. Mr. Harkema.

Courses for Graduates and Advanced Undergraduates

Zool. 513. Advanced Animal Physiology I. 3-0-0

Prerequisite: Zool. 301.

Fundamentals of animal physiology from an advanced point of view. Lectures, reading, term report. Mr. Evers.

Zool. 514. Advanced Animal Physiology II. 0-3-0

Prerequisite: Zool. 513.

Selected fundamental principles in physiology will be studied and interpreted for their relations to the vertebrates. Lectures and critical reports to promote acquaintance with general literature and recent advances. Mr. Evers.

Zool. 521. Limnology. 4-0-0

Prerequisites: Zool. 102, Bot. 102.

The ecology and productivity of inland waters. Collection, preservation, and identification of the aquatic animal life of North Carolina lakes, ponds, and streams. Mr. Quay.

Zool. 523. Animal Ecology. 0-0-5

Prerequisites: Zool. 101, 102.

The relations of animals to each other and to their environment, with emphasis on general principles and including practice in methods of studying populations and communities. Mr. Quay.

Zool. 532. Biological Effects of Radiations. 0-3-0

Prerequisites: Zool. 101 and approval of the instructor.

Recommended Correlatives: Gen. 411, Zool. 301, Bot. 421.

Qualitative and quantitative effects of radiations (other than the visible spectrum) on biological systems; to include both morphological and physiological aspects in a consideration of genetics, cytology, histology, and morphogenesis. Mr. Grosch.

Zool. 541, 543. Systematic Zoology. 3-0-3

Prerequisites: Zool. 101, 102.

The classification and ecology of selected groups of fishes, amphibians, and reptiles. Mr. Brandt.

Zool. 544. Mammalogy. 0-0-3

Prerequisites: Zool. 101, 102.

The classification and ecology of the major groups of mammals with particular emphasis on those native to the Southeastern United States. Mr. Barkalow.

***Zool. 545. Histology.** 5-0-0

Prerequisites: Zool. 101, 102, 223, 301.

The microscopic anatomy of animal tissues. Mr. Harkema.

Zool. 551, 552, 553. Wildlife Management. 3-3-3

Prerequisites: Zool. 251, 252, 253; Bot. 541.

The fundamental principles of Wildlife Management are studied in the field and laboratory. Three field trips are taken during the year.

Mr. Barkalow.

****Zool. 561. Animal Embryology.** 5-0-0

Prerequisites: Zool. 101, 102.

The study of fundamental principles which apply in the achievement of complex animal structure including both invertebrate and vertebrate materials. Correlative laboratory study to provide training in the basic disciplines and techniques. This course is intended for advanced students in entomology, animal industry, poultry science, and zoology. Mr. Harkema.

Zool. 571. Advanced Wildlife Management—Special Studies.

Credits by arrangement

Prerequisites: Zool. 551 or Zool. 312.

Directed individual investigation of a particular problem, accompanied by an advanced survey of literature. A maximum of six credits allowed toward the Master's degree and nine credits toward the Doctorate.

Messrs. Barkalow, Brandt.

Zool. 582. Wildlife Food Habits. 0-3-0

Prerequisites: Botany 101; Zool. 101, 102.

A general survey of the foods and feeding habits of fish, amphibians, reptiles, birds, and mammals, with laboratory practice in methods of conducting food habits studies. Mr. Quay.

Zool. 583. Advanced Food Habits Problems. 0-0-3

Prerequisite: Zool. 581.

Selected problem dealing with the foods and feeding habits of one species of wild animal or a group of similar animals. Messrs. Barkalow, Quay.

Zool. 591, 592. Parasitology I, II. 3-3-0

Prerequisites: Zool. 101, 102, 223.

The study of the morphology, biology, and control of the parasitic protozoa and helminths of man, domestic and wild animals. Mr. Harkema.

Zool. 593. Parasitology III. Medical Entomology. 0-0-3

Prerequisite: Permission of the instructor.

A study of the morphology, biology, and control of the parasitic arthropods of man, domestic and wild animals. Mr. Harkema.

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*Will not be offered in 1953-54.

**Will be offered in 1953-54.

Courses for Graduates Only

Zool. 603. Advanced Parasitology. 0-0-4

Prerequisites: Zool. 591, Zool. 592.

The study of the theoretical and practical aspects of parasitism; taxonomy, physiology, and immunology of animal parasites. Lectures, conferences, literature, and laboratory work. Mr. Harkema.

Zool. 611. Animal Ecology—Special Studies. Credits by arrangement

Prerequisites: Zool. 521 or Zool. 523.

Directed individual investigation of a particular problem, accompanied by an advanced survey of literature. A maximum of three credits allowed toward the Master's degree, and nine credits toward the Doctorate. Mr. Quay.

Zool. 622. Seminar. One credit per term

Prerequisite: Graduate Standing.

A maximum of three credits is allowed toward the Master's Degree, but any number toward the Doctorate. Staff.

Zool. 627, 628, 629. Zoogeography. 3-3-3

Prerequisite: Zool. 523.

Animal geography and the factors which influence the distribution of animals. Mr. Metcalf.

Zool. 641. Research in Zoology. Credits by arrangement

Prerequisites: Eighteen term credits in Zoology; consent of the instructor.

Problems in development, life history, morphology, physiology, ecology, game management, taxonomy, or parasitology.

A maximum of nine credits is allowed toward the Master's degree, but any number toward the Doctorate. Staff.

V. SUMMARY OF ENROLLMENT

1952-53*

1. Resident Students		
A. Candidates for Degrees		
1. Freshmen	1,481	
2. Sophomores	765	
3. Juniors	596	
4. Seniors	772	
5. Professional	30	
6. Graduates	386	
Total	4,030	4,030
B. Irregular Students		
†1. Extension Classes in Raleigh	324	
2. Special and Unclassified Students and Auditors	106	
Total	430	4,460
†2. Non-resident Students		
A. Correspondence Students for College Credit	1,721	
B. Correspondence Students in Practical Courses, no credit	11	
C. Extension Classes outside Raleigh	1,471	
Total	3,203	7,663
3. Summer School Students, 1952		
A. Regular Students (6 weeks)	1,061	
B. Special Students, Auditors, and Unclassified	14	
C. Forestry Camp (10 weeks)	33	
D. College Credit (6 weeks)	53	
Total	1,161	8,824
4. Short Courses and Special Conferences		
1. Beef Cattle Production Short Course	16	
2. Crop Production Short Course	8	
3. Dairymen's Conference	340	
4. Dairy Production Short Course	3	
5. Diesel Maintenance and Operation II	6	
6. Drivers Training School XXI	8	
7. Drivers Training School XII, Winston-Salem	26	
8. Institute of Gas Technology	12	
9. Pesticide School	134	
10. Refrigeration Maintenance Short Course	11	
11. Nurserymen's Short Course	65	

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* Does not include Spring Term 1952-53.

† Data from January 1, 1952 to January 1, 1953.

12. Commercial Flower Growers Short Course	58
13. Farm Management Short Course	23
14. Field Service Men's Short Course	64
15. Drivers Training School XIII, Winston-Salem	15
16. Institute of Gas Technology	7
17. Pest Control Operators School	47
18. Market Milk Short Course	9
19. Market Milk Conference	43
20. Artificial Breeding Short Course	26
21. D.H.I.A. Testers Training Course	18
22. Drivers Training School XIV, Winston-Salem	12
23. Ice Cream Conference	50
24. Institute of Gas Technology	6
25. N. C. Bus Drivers Training School, Winston-Salem	8
26. N. C. Safety School	105
27. State Garden School II, Hickory	136
28. State Garden School III, Fayetteville	123
29. State Garden School IV, Burlington	161
30. Drivers Training School XV, Winston-Salem	17
31. Grain Marketing Short Course	26
32. Institute of Gas Technology	3
33. N. C. Bus Drivers Training School, Winston-Salem	7
34. Drivers Training School XVI, Winston-Salem	9
35. Drivers Training School XVII, Winston-Salem	13
36. Group Discussion Leaders Short Course	21
37. Institute of Gas Technology	10
38. N. C. Bus Drivers Training School, Winston-Salem	7
39. Air Force Personnel Management Training Course	40
40. Cotton Classing Short Course	21
41. Electrical Meter School	122
42. Frozen Food Locker Short Course	14
43. Industrial Personnel Testing Institute	14
44. Industrial Psychology Short Course	4
45. Institute of Gas Technology	3
46. Production Control Short Course	7
47. Sewage and Industrial Waste Treatment School	93
48. D.H.I.A. Short Course	5
49. Drivers Training School XVIII, Winston-Salem	17
50. Institute of Gas Technology	4
51. Motion and Time Study Short Course	16
52. Furniture Finishing Short Course	27
53. Seedmen's Short Course	85
54. Welding Short Course	8
55. Corn Millers' Grading School, Goldsboro	25
56. Corn Millers' Grading School, Statesville	29
57. Drivers Training School XIX, Winston-Salem	17
58. Salt Water Sports Fishing Course	12
59. Small Sawmill Operators Short Course	14

60.	State Garden School I, Canton	114	
61.	State Garden School V, Raleigh	139	
62.	Artificial Breeding Short Course	18	
63.	D.H.I.A. Herd Testers' Short Course	5	
64.	Drivers Training School XX, Winston-Salem	11	
65.	State Garden School II, Wadesboro	81	
66.	Drivers Training School XXI, Winston-Salem	10	
67.	Farm Income Tax Course	56	
68.	Mid-Southeastern Gas Association	223	
69.	Southeastern Short Course—Marketing Fruits and Vegetables	102	
70.	Beef Cattle Conference	304	
71.	Drivers Training School XXII, Winston-Salem	11	
72.	Drivers Training School XXIII, Winston-Salem	18	
73.	Nutrition Conference	151	
74.	Gaston Technical Institute	62	
75.	Morehead City Technical Institute	45	
76.	4-H Club	1,064	
77.	Farm and Home Week	2,466	
78.	Future Farmers of America	1,300	
	Total	8,410	17,234

ENROLLMENT BY CURRICULA*

School of Agriculture

Agricultural Options	650
Agric. and Biol. Chem.	19
Agricultural Engineering	93
Dairy Mfg.	26
Wildlife Cons. and Mgt.	34
Total	822

School of Design

Architecture	193
Landscape Architecture	13
Total	206

School of Education

Agricultural Education	266
Industrial Arts Education	48
Industrial Education	4
Industrial Psychology	9
Ind. and Rur. Rec.	126
Math. and Science Educ.	15
Occup. Inf. and Guid.	3
Total	471

School of Engineering

Ceramic	29
Chemical	128
Civil	362
Construction	142
Diesel	7
Electrical	335
Engineering Mathematics	1
Engineering Physics	8
Furniture Mfg. and Mgt.	57
Geological	29
Heating and Air Cond.	51
Industrial	119
Mechanical	349
Mechanical, Aero Opt.	76
Nuclear	120
Total	1,813

School of Forestry

Forestry	77
Forest Management	67
Lum. Prod. Mfg. & Merch.	22
Pulp Technology	2
Wood Technology	13
Total	181

School of Textiles

Textile Chemistry	70
Textile Manufacturing	8
Textiles	430
Total	508

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Unclassified Undergraduates, Auditors and Special Students	106
Unclassified Graduates	29

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Distribution of Graduate students by schools (included in above departmental classifications).

Agriculture	158
Education	54
Engineering	121
Forestry	12
Textiles	12
Total	357

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* Does not include Spring Term 1952-53.

SIXTY-THIRD ANNUAL COMMENCEMENT

June 8, 1952

DEGREES CONFERRED
SCHOOL OF AGRICULTURE

BACHELOR OF SCIENCE
IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

David Quentin White	Chattanooga, Tenn.

IN AGRICULTURAL ECONOMICS

Burrell Dean Angell	Winston-Salem
*Robert Christopher Ballance	Fremont
William Lester Carpenter	Lincolnton
David Spessard Cook	Leaksville
Paul Orville Ferrell	Durham
Richard Francis Harrison	Ayden
Pemberton William Hobbs	Raleigh
Charles Lucien Baker Lowndes, Jr.	Durham
J. Bundy Needham	Pilot Mountain
Lambert Morris Sutton	Faison
Robert Ernest Wall, Jr.	Leaksville

IN AGRICULTURAL ENGINEERING

Fredrick Zane Blevins	West Jefferson
James Otto Byers, Jr.	Edneyville
Sidney Taylor Currin	Oxford
John Pinkney Dail, Jr.	LaGrange
*Thomas Harold Garner	Farmer
Adam Hugh Harris, Jr.	Oriental
Boliver Tremaine Harris	Spring Hope
David Franklin Jones, Jr.	Kenansville
Eugene Clifton Mills	Welcome
William Gordon Mitchell	Reidsville
Charlie King Overby	Warrenton
William Stevenson Patterson	Stony Point
Burton Davis Smith	Fremont
Horace Anderson Smith	Gastonia
Bernard Spilman Sutton	Raleigh
Ray Kent Troutman	Statesville
Worth Amos Wooten	Princeton

IN AGRONOMY

George Skinner Averette	Oxford
Allison Lamar Barham	Wendell
Ernest Worth Barnes	Salisbury
Edward Lee Brady	Burlington

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* With Honors.

Stacy Alton Butler	Clinton
Joel Watkins Cawthorn	Warrenton
*Charles William Coggins, Jr.	Cherryville
*Latta Wilkings Cook	Fayetteville
Billy Lee Foutz	Landis
Jamal Abdul-Karim Fuad	Sulaimania, Iraq
William Buxton Griffin	Rocky Mount
*George Richard Gwynn	Yanceyville
William Robert Harris	Robersonville
*George Winfred Hawkins	Rockingham
William Smith Howell	Goldsboro
**Wiley Carroll Johnson, Jr.	Canton
Luther Gene Lamm	Lucama
**Robert Edmund McCollum	Reidsville
Sam Frank McGhee, Jr.	Raleigh
Julian Holmes McIntyre	Maxton
*Walter Glenn Maxwell	Raeford
James Winston Miller	Todd
Alvin Creech Newsome	Ahoskie
Willis Henry Overby	Lawsonville
Frank Cauble Patterson	China Grove
*Jack Wallace Permenter	Wampee, S. C.
Jack Harold Reese	Easton, Pa.
Grover Tilghman Rodgers, Jr.	Washington
Benjamin Franklin Scarborough, Jr.	Hookerton
William Russell Shackleford	Fremont
Edward Jackson Simpson	Roanoke Rapids
Wilbur Samuel Strickland	Bailey
Roy Vernon Tew, Jr.	Godwin
Gerald Mercer Ward	Whitakers
Guy Milton Whitford	Vanceboro

IN ANIMAL INDUSTRY

John Lewis Arndt	Mount Holly
Harold Alvin Ballard	Mars Hill
*John Cook Blair	High Point
David Gerson Boyette	Scotland Neck
Wayne Brooks	Sparta
Rupert Carlyle Butler	Reidsville
Hugh Carson Calton	Bostic
John Nolan Collins	Troutman
*George Cleve Daniel	Blanch
Thomas Philmore Dellinger, Jr.	Crossnore
John Armstrong Dinan	Miami, Fla.
Joseph Leslie Everett	Newsoms, Va.
**Barton Roby Farthing	Sugar Grove

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* With Honors.
** With High Honors.

Donald Smith Fincher	Matthews
Joe Sylvanus Hamrick	Shelby
Max Ralston James	Statesville
Norman Arthur Jordan	Siler City
Ray Preston Karriker	Mooresville
David Clark Knox	Cleveland
John Fletcher Long, Jr.	Statesville
William Perry Martin	Cramerton
Robert Bacon Nichols, Jr.	Efland
Duncan Duvol Pace	Selma
Kenneth Thompson Patterson	Hiddenite
*Earl Elmer Ray	Burnsville
Frank Clark Riddle, Jr.	Gastonia
Richard Cain Roberts	Hillsboro
Robert Walter Scott	Haw River
Alton Kinsley Spencer, Jr.	Columbia
Thomas Earl Staton	Monroe
*Francis Herbert Swain, Jr.	Southport
James Howard Thompson	Mountain Park
Walter Boyce Turner	Stanfield
**James Edward Via	Goldsboro
William Cyrus Willcox	Carthage
John Hunter Wynne	Rocky Mount
Clyde Thomas Young	Carrboro
Rogelio Zuniga Zertuche	Mexico City, D. F.

IN DAIRY MANUFACTURING

Charles Boyd Culp	Charlotte
Paul Herman Mitchell	Hiddenite
James Alan Scroggs	Roaring River
Marshall Napoleon Tatum	Fayetteville
Gerald Donald Washburn	Shelby

IN EXPERIMENTAL STATISTICS

*John Ralph Stump	Nathan's Creek

IN HORTICULTURE

*Donald Gregory Betts	Clearfield, Pa.
Ralph Cooper Compton, Jr.	Cedar Grove
Walter Fedoronko	Burgaw
Martin Laval McIntyre	Raeford
August John Nielsen, III	Edneyville
Harold Lee Sprinkle	Asheville
William Hendrick Swart	Wilmington

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* With Honors.
** With High Honors.

IN POULTRY SCIENCE

**Timothy Scott Chang	Fukien, China
Joe Kenneth Davis	Earl
Zane Grey Futrell	Stokes
Lester Maxwell Greene, Jr.	Raleigh
Ralph James Peeler, Jr.	Raleigh
Billy Lee Phillips	Siler City
William Marvin Sexton	Plymouth
Charles William Teseneer	Shelby
Lester Jack Wilson	Wilmington
*Alfred Frank Wood	Greensboro

IN RURAL SOCIOLOGY

Neill Shaw Brown	Red Springs
Christopher Rodolph Davenport	Alexandria, Va.

IN WILDLIFE CONSERVATION AND MANAGEMENT

Charles Robert Bradford	Harrisonburg, Va.
Edward Braxton Bradley	Rocky Mount
Hugh Martin Fields	Wilson
Charles Efird Hill	Stanfield
*Edward Ray Smith	Avon, N. J.

SCHOOL OF DESIGN

BACHELOR OF ARCHITECTURE

Bill Joe Addison	Reidsville
Harry Bates	Lake City, Fla.
Bosworth Clifton Beckwith	Raleigh
*Albert Barnes Cameron	Charlotte
John Foster Faulk	Sanford
Gene Watts Jones	Durham
Richard Pleam Leaman	Lancaster, Pa.
*Elizabeth Bobbitt Lee	Lumberton
Thomas Lyonell McCrory	Bartlesville, Okla.
James Hunter Mitchell	Biltmore
David Bowen Oden, Jr.	Winston-Salem
Chester Arthur Parker	Durham
Raymond Cecil Sawyer	Shawboro
Gerald Ira Schiff	New York, N. Y.
Richard Burke Schnedl	Charlotte
*Jack Coffman Schriver	Knoxville, Tenn.
James Nelson Sherrill	Winston-Salem
Edward Harper Shirley	Greenville, S. C.
William Albert Sloan	Mount Ulla
Robert Faires Stone	Asheville
Henry Grady Walker, Jr.	Raleigh

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* With Honors.
** With High Honors.

BACHELOR OF LANDSCAPE ARCHITECTURE

Edmund Ellsworth Ely	Washington, D. C.

BACHELOR OF SCIENCE IN LANDSCAPE ARCHITECTURE

Mary Glenn Sanford Rose	Telford, Pa.

SCHOOL OF EDUCATION

BACHELOR OF SCIENCE IN AGRICULTURAL EDUCATION

John Robert Benbow	Oak Ridge
**Carl Thomas Blake	Burgaw
*Robert Joseph Bowers	Sanford
Cecil Fred Brown	Leicester
George Carroll Creech	Snow Hill
John Dudley Dodson	Reidsville
Richard Thomas Duke	Potecasi
Brode Horest Harrell	Colerain
Joe Knox Harris	Dallas
Larry Latham Hodges	Stokes
Edward Thomas Hollowell	Rich Square
Thomas Nickels Holmes, Jr.	Sanford
Kenneth Rudolph Langley	Princeton
Fred Emmett Lay, Jr.	Tabor City
Gilbert Ashley Lewis	Fairmont
William Marvin Lindsay, Jr.	Fayetteville
Robert Wilburn Long	Hillsboro
*Murphy Grady McKenzie, Jr.	Lumberton
John Tyson Mills	Polkton
James Lloyd Moore	Williamston
Maynard Harrison Owens	Saratoga
**Astor Perry	Shell Creek, Tenn.
Bobby Dew Perry	Bailey
Jarvis Wesley Perry, Jr.	Zebulon
Thomas Watson Rakestraw	Reidsville
Robert Alton Randall	Kings Mountain
Charles Herman Rogers	Clarkton
Jack Erwin Russell	Concord
Robert Osborn Sanderson	Magnolia
William Talmadge Sellers	Shallotte
James Everette Sheffield	Biscoe
**George Eugene Spain	Henderson
Overton Copeland Stewart	Clifty, Tenn.
Ernest Burleigh Taylor	Merry Hill
James Robert Tippett	Franklin
John Edward Townsend	Buie
Herbert Arnold Trost	Green Forest, Ark.

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* With Honors.
** With High Honors.

George Hubert Turner, Jr.	Raleigh
John Burton Waddell	Fair Bluff
*Carl Benjamin Wagner	Taylorsville
Charles Allen Ward	Denton
Alton Adolph Warren	Clinton
Max Poston Webb	Salisbury
George Robert Wilson	Dunn
*Sanford Eugene Younts	Lexington

IN INDUSTRIAL ARTS EDUCATION

Gene Holton Anthony	Knightdale
Ralph Calvano	Hawthorne, N. J.
Charles Royall Exum	Fremont
*Elmer Henry Mades	Woodbridge, N. J.
William Gordon Maguiness	Plainfield, N. J.
Julian Robert Rawls, Jr.	Oak City
Bruce Benard Roberts	Mars Hill
*Thomas Clinard Shore, Jr.	Rocky Mount
Lloyd Benjamin Stevens	Goldsboro
**James Stokes Travis, Jr.	Apex
Walter Neal Watt	Charlotte
James Morton Willis	Harkers Island

IN INDUSTRIAL EDUCATION

Milton James Lamb	Hampton, Va.
Stephen Bragaw Privette	Spring Hope

IN INDUSTRIAL AND RURAL RECREATION

Glenn Stearns Bingham	Raleigh
James Ferdie Boseman, Jr.	Scotland Neck
Arthur Howell Boyer	Indianapolis, Ind.
Donald Grady Cheek	Shelby
Elmer Henry Costa	Haledon, N. J.
Benjamin Langley Dixon	Washington
Arthur Thomas Edwards	Raleigh
*Paul Jones Johnson, Jr.	Hendersonville
Matthew Albert Lojko	Providence, R. I.
James Edward McComas	Shelbyville, Ind.
John Charles Martin, Jr.	Larksville, Pa.
Edward Washington Mooney, Jr.	Draper
Charles Joyce Moore	Washington
Eugene Nelson	Topton
John Raymond Paschal	Raleigh
Robert Griffith Prongay	Winston-Salem
Leroy Springs Ramsey	Wilson
Johnny Wilburn Rhea	Canton

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* With Honors.
** With High Honors.

Maynard Earl Shields	Canton
Joe Donald Stoll	Princeton, Ind.
Evelyn Louise Vereen	Raleigh
Dwight Randolph Warren	Washington, D. C.
James Clyde Williams	Wake Forest

IN MATHEMATICS AND SCIENCE EDUCATION

*Rachel Frances Ammons	Mars Hill
*Henry Madison Davis, Jr.	Hendersonville
Martha Bryte Lane	Ramseur
Richard Montgomery Prevatt, Jr.	Lumberton
Robert Sloane Ward, Jr.	Fayetteville

SCHOOL OF ENGINEERING

BACHELOR OF CERAMIC ENGINEERING

Kenneth Walter Hansen	Staten Island, N. Y.
Willis Eley Hawkins, Jr.	Roanoke Rapids
Robert Bernice Hockaday	Raleigh
John Meredith Rauscher	Mansfield, Pa.
Harry Reid Stowe	Charlotte

BACHELOR OF CHEMICAL ENGINEERING

John Hampton Alley	Waynesville
Ambrose Hubert Ballard	Kipling
Bobby Beard	Thomasville
Richard Earl Brownlee	Charlotte
Robert Lester Bryan, Jr.	Burlington
Charles Andrew Cole, Jr.	Phoebus, Va.
Grady Nicholson Dulin, Jr.	Lexington
Brewster Blanton Eskridge	Shelby
Leslie Ballard Evans	Raleigh
William Ray Flack	Marion
George Lawrence Harris	Capon Bridge, W. Va.
Richard Lawrence Hinson	Charlotte
Lester Clyde Jarvis	Farmington
**Rolf Kaufman	Waynesville
*Marion Everette Lattimore	Polkville
Joseph Crowder Mason, Jr.	Winston-Salem
*Forest Orion Mixon, Jr.	Raleigh
*Joseph Dixon Parker	Norfolk, Va.
Billy Austin Presson	Spruce Pine
Julian Sharpe Pruitt	Carteret, N. J.
George Pinkney Robinson	Vale
Charles Hutchins Sedberry	Salisbury
John Thelbert Shinn	China Grove

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* With Honors.
** With High Honors.

Lumas Carper Thomas, Jr.	Durham
Moultrie Butt Watts	Raleigh
Hugh Dixon White, Jr.	Guilford College

BACHELOR OF CIVIL ENGINEERING

*John Perry Allen	Kannapolis
John Bryant Bagwell	Raleigh
Ransom Vernon Bennett	Morganton
James Franklin Brown	Statesville
Marvin Lacy Brown	Parkton
*Reginald Buie	Pensacola, Fla.
Edwin Buell Constantine, III	St. Petersburg, Fla.
**William Otho Crabtree	Raleigh
Archie Augustus Davidson, Jr.	Statesville
Richard Joe Davis	Raleigh
Joe Motley DeShazo	Ashland, Va.
Robert Stanley Dobbins	Union, S. C.
John Andrews Edwards	Snow Hill
Rudolph Edward Etheridge	Roanoke Rapids
Lester Anderson Foster, Jr.	Granite Quarry
George Edward Freeman	High Point
Herbert Boyd Greene, Jr.	Raleigh
Donald Clayton Griffin	Reidsville
Charlie Edward Hagwood	Louisburg
Karl LeRoy Harrod	Washington, D. C.
Charles Emmett Hicks, Jr.	Norfolk, Va.
Harold Joe Jarrell	Salisbury
Billy Eugene Jenkins	Maiden
Raoul Bullard Jones	Asheville
James Everette Kearns	Huntington, W. Va.
Joseph Ryder Lewis, Jr.	Carolina Beach
Franklin Armfield Linney	Newport News, Va.
James Duncan Little, Jr.	Marshville
Clyde Harold McKinnon	High Point
*Nicholas Constantinos Matalas	Henderson
*Howard Franklin Morris	Greensboro
Arthur Franklin Nelson	Stamford, Conn.
*Robert Charles O'Neal	Manteo
James Edwin Phillips	Fountain
*James Floyd Poovey	Hickory
George Baxton Pruden	Raleigh
Dana Henry Rucker, III	Raleigh
*David Womble Sharpe	Pittsboro
James Desmond Simmons	Ash
*Carl Horatio Smith	Harrelsville
John William Smith	Lexington

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* With Honors.
** With High Honors.

Wiley Cleveland Stephenson, Jr.	Pendleton
William Edgar Taylor, Jr.	Raleigh
*Robert John Tredik	Roselle, N. J.
Aaron Calhoun Turnage, Jr.	Farmville
*James Leet Vannoy	West Jefferson
*Hal Gordon Waddell, Jr.	Burlington
Kenneth Lee Welch	Franklin
James Lewis Wilburn	Fayetteville
Earl Edward Williams	Drexel
Robert Carroll Williams, Jr.	Winston-Salem

BACHELOR OF SCIENCE IN CONSTRUCTION

John Warren Bell	Greensboro
Harold Norman Bellucci	New London, Conn.
Miles Johnson Boyer	Charlotte
Bobby Barrow Brown	Oak Ridge
William Matt Christian, Jr.	Rocky Mount
William Brown Cook	Whiteville
James Beverly Dooley	Statesville
Joseph Farrior Edwards	Enfield
Tommy Lee Everhart	Stanley
*Thomas Campbell Fite	Charlotte
James Thomas Flythe	Raleigh
John Ruben Harrison, Jr.	Winston-Salem
**John Richards Hay, Jr.	Hickory
Bobby Eugene Leonard	Raleigh
Thomas O. Mullins, Jr.	Oxford
Frank Edward Perkins, Jr.	Laurinburg
Eugene Fedelis Pettinelli	Elmhurst, N. Y.
Robert McClean Puckett	Charlotte
Richard Robinson Richardson	Goldsboro
*Alan Craig Roland	Kernersville
William Hugh Sanderson	Rocky Point
William deRosset Scott, Jr.	Graham
Claude Petty Smith	Greensboro
Odis Bennett Summers	Kannapolis
McIver Aflen Wicker	Greensboro
Thomas Harvey Wilkinson, Jr.	Charlotte
Alton Miles Wingfield	Burlington
Joseph Zak	New York, N. Y.
Joseph Maxton Ziglar	Leaksville

BACHELOR OR ELECTRICAL ENGINEERING

Flake Long Adkins, Jr.	Winston-Salem
Charles Slaton Alexander	Wilmington
Alonzo Craig Baity, Jr.	Winston-Salem
**James Burnell Baker	Reidsville

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* With Honors.
** With High Honors.

Michael John Balog, III	Tarentum, Pa.
Homer Marion Barnes	Boone
Marion Leonard Barnett	Atlanta, Ga.
**Walter Teachey Batts	Rose Hill
Richard Carleton Bean	Winston-Salem
*Frederick Starr Bergman	Winston-Salem
*Richard Lovell Berry	Greensboro
Charlie Leslie Britt, Jr.	Charlotte
Norman Lee Crews	Winston-Salem
James Royle Davis	Morganton
Edward Francis Downey	Pleasantville, N. J.
Edward Carlton Duncan	Raleigh
Thomas Henry Faulkner	Kinston
Samuel Emerson Fort, Jr.	Winston-Salem
*James Creed Foster	Wilmington
William Bryan Frye, Jr.	Salisbury
Rupert Cash Funderburk, Jr.	Monroe
*Major Worth Hewett	Wilmington
*Charles Anderson Idol	Madison
William Boyd Jones	Greenwood, S. C.
Vernon Douglas Kemp	Farmville
Frederick McArtor Kerr	Charlotte
Robert Babb Knoop	Hendersonville
Dougald Stuart McCormick, Jr.	Fayetteville
*James Howard McLain, Jr.	Charlotte
**John Sullivan Mayo	Greenville
Samuel Merral Moss	Raleigh
*John William Niestlie, Jr.	Winston-Salem
Raymond Vincent Parent	Niagara Falls, N. Y.
Robert Gerald Penny	Raleigh
Lars Oscar Peterson, Jr.	Bryn Mawr, Pa.
*Walter Quick	Charlotte
Herbert Wilson Ramsey	Kinston
*James Earl Ramsey, Jr.	Denver
Robert Wendell Reed	Forest City
*Burton Wells Richardson	Salisbury
Henry Hampton Rothwell	Raleigh
*Howard Thomas Sadler	Greensboro
**Eugene Clemens Sakshaug	Flasher, N. D.
Charles Houston Saunders, Jr.	Reidsville
*George Wallace Smith, Jr.	Raleigh
Ralph Lamuel Smith, Jr.	Charlotte
Therell Asbury Stout	Thomasville
Julius Tate Thompson	Rocky Mount
Marvin Yowell Thorne	Elm City
William Finch Troxler	Raleigh

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* With Honors.

** With High Honors.

*Francis Hardy VanLandingham	Greensboro
**Arthur William Vernon	Newport News, Va.
Robert Alexander Wade	Asheville
William Harper Wilson	Bakersville
*Weldon Ray Word	Asheville

BACHELOR OF SCIENCE IN FURNITURE MANUFACTURING AND MANAGEMENT

*Thomas Edward Allen	Oakboro
Harry Elliott Beatty, Jr.	Roanoke, Va.
Cannon Glover Bedford, Jr.	High Point
Cecil Theodore Bost, Jr.	Hickory
Vernon Carlton Broyhill	Boomer
Arnold Benjamin Cochrane	Lincolnton
Ellsworth Woodward Ford	Winston-Salem
George Stewart Forester, Jr.	N. Wilkesboro
Malcolm Maxwell Hale	Raleigh
Norris Clark Hatcher, Jr.	Mount Airy
Kerford Aldin Key	Roanoke, Va.
Harold Cline McGee	Newton
Clarence Haywood Mabry	Albemarle
Wade Shamburger Page	Asheboro
James Athol Rodgers	Thomasville
Jehu Benjamin Travis	Apex
William Blanchard Trollinger	Laurinburg
John Bassett Vaughan	Galax, Va.
Duane Emery Ward, Jr.	Galax, Va.
Donald Gray Warren	Mebane

BACHELOR OF SCIENCE IN GENERAL ENGINEERING

Robert Isaac Lee, Jr.	Raleigh

BACHELOR OF GEOLOGICAL ENGINEERING

Clement Manly Llewellyn, Jr.	Concord
Roy Bratton Moffitt	Greensboro
Herman Newton Nunis	Charlotte
James Howard Terry	Burlington
Walter Gay Wells, Jr.	Wallace

BACHELOR OF SCIENCE IN HEATING AND AIR CONDITIONING

George Coleman Ashley	Fairmont
Ben Leroy Christenbury	Charlotte
*Edwin Ruphen Malin, Jr.	Greensboro
Augustus Muckenfuss	Burlington
Robert Frazier Smith	Charlotte

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* With Honors.
** With High Honors.

BACHELOR OF INDUSTRIAL ENGINEERING

Paul Hadden Avery	Erwin
*Jack Ronald Barkley	Statesville
William Stanley Bradley	Raleigh
Ruffner Campbell, Jr.	Asheville
Carl Oscar Carlin, Jr.	New Bedford, Mass.
Edwin Benjamin Chapman	Charlotte
*Raymond Lee Collins	Hickory
Herman Leon Cook	Clemmons
William Lynch Davis	Mount Olive
*Stuart Ridgely deWitt	Charlotte
Henry Louis Dixon	Winston-Salem
William James Evans, Jr.	Burlington
**Charles Russell Farinholt	Hilton Village, Va.
Walter Allen Gurley	Seven Springs
Earl Darrell Haynie	Swannanoa
David Marsh Lambert	High Point
Jerry Dale Lewis	Wilmington
Owen Clinton McKinnie, III	Durham
Robert Alexander McLean	Mount Olive
*Suresh Jivanlal Mehta	Bombay, India
Barry Carson Payne	Charlotte
Grady Francis Peterson	Whiteville
Donald Stone Pike	Goldsboro
George Barron Pressly	Tampa, Fla.
Herman Reaves Price	Leaksville
William Lowrance Rhyne	Catawba
Donald Lorain Roberts	Rew, Pa.
James Asa Rodgers	Plymouth
Steven Richard Serletis	New York, N. Y.
*Paul Eugene Smathers	Canton
Robert Russell Sugg, Jr.	Badin
Charles Francis Talton	Oxford
*John Wilkerson Thompson, Jr.	Goldsboro
James Whitridge Twyford	Dunn
James Frederick Underwood	Salemburg
*William Vogedes, Jr.	Baltimore, Md.
*Van Wyck Williams, Jr.	Greensboro
David Norman Zauber	Greensboro

BACHELOR OF MECHANICAL ENGINEERING

Neal Patterson Alexander	Charlotte
Harry Brinkley Anderson	Enfield
Milford Jones Auger	Whiteville
George Ray Ballance	Elizabeth City
Carlos Alberto Bogliaccini	Montevideo, Uruguay

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* With Honors.
** With High Honors.

*Douglas Johnson Burbage, Jr.	Newport News, Va.
Carlisle Caston Campbell, Jr.	Leaksville
David Wilson Conley	Morganton
James William Culp	Laurinburg
**Alfred Marcel Demeulenaere	Brussels, Belgium
*Earl Harlen Elliott	Marion
Paul Herbert Eudy	Concord
Claude Lawrence Gilbert, Jr.	Statesville
Joseph Greco	Erie, Pa.
*Robert Edward Hadlow	Rocky Mount
James Robert Hassinger	Raleigh
Rollins Eafram Helms	Gastonia
Leon Merrette Hobbs, Jr.	Lumberton
Erle Manning Hutchins	Winston-Salem
William Ware Kendall	Charlotte
Zane Cruse Ketner	Rockwell
*Robert Carney Kinser	Asheville
Douglas Bryan Knowles	Wallace
James Floyd Knowles	Wallace
Lemuel Thomas Landen, Jr.	Wilmington
*Hugh Leighty	Elkins, W. Va.
*John Henry LeRoy, III	Elizabeth City
William David Lineback	Winston-Salem
**Harold Richmond Lominac	Asheville
Joseph Valentine Lowe, Jr.	Wadesboro
Charles Isaac McLain	Statesville
Joseph Pretlow Majette	Como
Gerald Davis Mann	Newport
Robert Luther Miller, III	Wilson
William Franklin Morgan	Troutman
John Charles Morris	Raleigh
Miguel Angel Muniz y Sotolongo	Amarillas, Cuba
**James Emerson Newton, Jr.	Charlotte
John Ellis Nicholson	Raleigh
Thomas Alexander Owen	Kingsport, Tenn.
Benjamin Samuel Powell, Jr.	Charlotte
Henry Corum Quay, Jr.	Harrisburg
Mark Allen Reid	Albemarle
William Allen Riddick, Jr.	Asheville
*Jack Oliver Robertson	Raleigh
Glenn William Rodgers, Jr.	Charlotte
**John William Schlirf	Winston-Salem
Hugh Leonard Sellers, Jr.	Smithfield
Donovan Rosser Seward	Niagara
Robert Morrison Shaw	Charlotte
William Earl Waddell	Rocky Mount

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* With Honors.

** With High Honors.

Dean Alan Warner	Western Springs, Ill.
*Donald Richard West	Winston-Salem
*Guy Cogdill Wiggins	Franklin
Clarence Alexander Wingate, Jr.	Charlotte
Thurman Dewey Womble, Jr.	Rocky Mount

BACHELOR OF MECHANICAL ENGINEERING AERONAUTICAL OPTION

William Ellington Broach	Raleigh
Hoyt Vernon Brown	Statesville
Arthur Allan Crews	Kernersville
*Jack Everitt McCormick	Kenmore, N. Y.
*Richard Cousins Morenus	Atlanta, Ga.
*William Colon Parks	Greensboro

BACHELOR OF MECHANICAL ENGINEERING HEATING AND AIR CONDITIONING OPTION

Claude Archibal Ford, Jr.	Southport

BACHELOR OF NUCLEAR ENGINEERING

James Robert Barton	Binghamton, N. Y.
*Mayhue Arnold Bell	Blounts Creek
*Jerry Allen Berrier	Winston-Salem
*James Raymond Bohannon, Jr.	Salisbury
*Lewis Love Bowen	San Antonio, Tex.
**Charles Thomas Bradshaw	Norfolk, Va.
*Claude Sidle Burtnette, Jr.	Memphis, Tenn.
**Wesley Osborne Doggett	Brown Summit
**Robert Giles Ellis	Fresno, Cal.
*Max L. Erwin	South Bend, Ind.
*Fred Gearld Gillesby	Nampa, Idaho
*Edward Exum Hood, Jr.	Boonville
**Donald Edward Hostetler	Raleigh
Clarence Earl Ingersoll	Rocky Mount
**Fred Neil Mortensen	Ephraim, Utah
*Charles Sheldon Oldfield	San Francisco, Cal.
*Warren George Palmer	Berkeley, Cal.
**William Arthur Tesch	Raleigh
**Joseph Marvin Weaver	Weaverville
*Robert Owen Williams, Jr.	Geneva, N. Y.
*Laymont Vinson Woodruff	Conway, Ark.

SCHOOL OF FORESTRY

BACHELOR OF SCIENCE IN FOREST MANAGEMENT

George Melvin Blanchard	Lynn, Mass.
Harold Junior Boger	Salisbury

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* With Honors.
** With High Honors.

Jack Joe Cornette	Morristown, Tenn.
**James Dan Crook, Jr.	Asheville
Harry Robert Garrett	Columbus, Ohio
John Elton Graham	Etowah, Tenn.
*Thomas Newton Hardin	Jacksonville
*Henry Grady Harris, Jr.	Louisburg
Joe Sanford Hinshaw	Elkin
Samuel Maris Hughes	Hillsboro
Clyde Alfred Jackson, Jr.	Greensboro
John Vance Jackson, Jr.	Wake Forest
Eugene Noah Jordan	Tyner
Robert Kral	Oak Park, Ill.
George Elbert Lamb	Asheville
Carl Leaton Lane, Jr.	Raleigh
James Ingram Ledbetter	Mount Gilead
John Levis LeRoy	McCormick, S. C.
Steven Eugene Lewis	Fayetteville
Bennie Charles Meeker	Jonesboro, Ark.
David Walker Morison	Asheville
George Paul Peroni	Norwich, Conn.
Donald Frederick Petersen	Lincoln, Maine
Robert Bridger Phelps	Windsor
**Joseph Browning Reid	Washington, Va.
Robert Gene Reyns	Covington, Va.
Vincent Ronald Ross	Somers, N. Y.
Hugh Alexander Tate, Jr.	Rose Hill

IN LUMBER PRODUCTS MANUFACTURING AND MERCHANDISING

Lloyd Arthur Cramer	Blanchester, Ohio
William Kenneth Lusk	Williamson, W. Va.
Joe Henry Miller	Winston-Salem
Alan Morgan Neilson	Asheville
William Van Tate, Jr.	Winston-Salem

SCHOOL OF TEXTILES

BACHELOR OF SCIENCE IN TEXTILES

Eugene Morrison Adkins, Jr.	Charlotte
*Nazir Ahmad	Sargodha, Pakistan
*Purshottam Nandlal Amersey	Bombay, India
Robert Lewis Ammons	Raleigh
Harold Themis Anderson	New York, N. Y.
*Robert William Anderson	Franklinton
Maurice Deal Atwell, Jr.	Marion
William Deshel Bandes, Jr.	Nescopeck, Pa.

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* With Honors.

** With High Honors.

Fred Robert Beaver	Asheville
William Watson Bishop, Jr.	Rockingham
William Martin Blackmon	Durham
Benjamin Allen Bobbitt	Enfield
Monroe Sheldon Brettler	New York, N. Y.
Kenneth Gordon Camelford	Dunnville, Ontario, Canada
**Joseph Alexander Emile Carrier	Hull, Quebec, Canada
James Noah Cheek	Rockwell
Walter McKenzie Clark	Greensboro
*Betty Anne Cline	Raleigh
Stanley Cohen	Flushing, N. Y.
**Gerald Stoddard Conger	Ottawa, Ontario, Canada
Charles Harrison Cothran, Jr.	Evergreen
John Columbus Cowan, III	Greensboro
Billy Wrenn Cross	Martinsville, Va.
George David Curtis, Jr.	Burlington
Gaetano John D'Annolfo	South Barre, Mass.
John Fletcher Dermid	Hendersonville
Josiah Withers Doar	Charlotte
*James Hoar Duffy	South Wilmington, Conn.
Murray Alan Eig	New York, N. Y.
Stanley Mitchell Ellington, Jr.	Henderson
Henry Coleman Fleming, Jr.	Warrenton
Richard Dean Flynn	Greensboro
Paul Robbins Foght, Jr.	Kenosha, Wisc.
Floyd Houston Foster	Concord
Hannibal Carl Fowler	Fries, Va.
William Stewart Futch	Charlotte
Charles Jackson Gamble	Kings Mountain
Esley Eugene Gantt	Shelby
Henry John Garrou, Jr.	Valdese
William Alfred Geiler	Nutley, N. J.
Richard Wayne Gillon	Kannapolis
Leland Hugh Greenberg	Greensboro
Lewis Richardson Hackler	Wilmington
John Chilton Harralson	Princeton, Ky.
*Joel Norman Heim	New York, N. Y.
*William Clemence Herrmann	Kenosha, Wisc.
Bryan Boggs Higgins	Shelby
William Robert Higgins	New Bern
William deRosset Holt, Jr.	Fayetteville
Preston Cromwell Huffman	Hickory
William Grey Humphrey	New Bern
Haiim Abdul-Nabi Jacob	Basra, Iraq
William Elias James, Jr.	Darlington, S. C.
Eugene LaVerne Jeffords	New York, N. Y.

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* With Honors.

** With High Honors.

Jack Neal Jolly	Mount Holly
Walter James Keeter, Jr.	Cramerton
Clarence Paul Keever	Marshville
John Richard Kellam	High Point
*Kare Marius Kragas	Oslo, Norway
William Neal Lilly	Raleigh
David Alexander Lowe, Jr.	Charlotte
Bob Pierson Luckadoo	Forest City
**Howard Nathaniel Lumley, Jr.	Greensboro
Colin William McKenzie, Jr.	Pinehurst
Donald Henry Maharam	Forest Hills, N. Y.
Robert Donald Maharam	Flushing, N. Y.
William Margolis	Brooklyn, N. Y.
David Elias Marrus	New York, N. Y.
Raymond Miller Maxwell, Jr.	Walkertown
Henry Eugene Mock	Raleigh
Richard Lee Morris	Brooklyn, N. Y.
Richard Warren Munroe	Larchmont, N. Y.
*Joshua Edgar Murrow, Jr.	Greensboro
James Willard Muse, Jr.	Durham
Chung San Nieh	Shanghai, China
**Chi-Hsun Pan	Chungkin, China
*Billy Frank Patterson	Greensboro
Alan Lafayette Payne	Rural Hall
Bryce Chesson Peacock	Raleigh
*Alexander Leon Perper	Miami Beach, Fla.
Caldwell Ragan, Jr.	Gastonia
Anthony Bruce Reid	Philadelphia, Pa.
James Lemonde Reinhardt	Charlotte
James Frank Richie	Gastonia
John Daniel Robbins, Jr.	Rocky Mount
William Moody Rogers	Albemarle
Harvey Harry Scheviak	Kenosha, Wisc.
Gerald Montroville Shaver	Roanoke, Va.
John Calvin Shaw	Fayetteville
Howard Truman Shell	Havelock
**John Lawrence Sherrill	Cornelius
Fred Harris Shugart	Elkin
Warren Crapon Sibley, Jr.	Chesnee, S. C.
**Philip William Siegel	Union City, N. J.
Jose Custodio Silva Netto	Rio de Janeiro, Brazil
Allen Jefferson Simpson	Monroe
William Tate Simpson	Burlington
Wade Samuel Soesbee	Canton
*Burton Leonard Sokol	Detroit, Mich.
Robert Algernon Stewart	Laurinburg

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* With Honors.

** With High Honors.

Paul Donnie Sweatt	Kannapolis
Andrew Teszler	New York, N. Y.
Laurence Elton Thomas	Kinston
Adriaan Johan Troeleman	New York, N. Y.
Simmons Edwin Turner	Martinsville, Va.
*Lee Dudley Walker	Martinsville, Va.
James Marion Ward, Jr.	Greenville
George Stephen Watts	Shelby
Edwin Desborough Webb	Raleigh
Howard Petree Westmoreland	Rural Hall
Charles Henry Whitehead	Mooresboro
*Kuo-Chuan Woo	Shanghai, China

IN TEXTILE CHEMISTRY AND DYEING

Osman Nuri Arslan	Zonguldak, Turkey
Joseph Roscoe Belche, Jr.	Fayetteville
Lewis Palmer Bratton	Raleigh
Hubert Ray Broome	Mount Holly
Ralph Wayne Cashion	Kannapolis
Robert Clifton Crawford	Gastonia
Roger Moore Crosby, II	Denver, Col.
*Jack Alfred Dayvault	Landis
**Hubert Salim Ghosn	Alexandria, Egypt
William Daniel Hicks	Henderson
**Donald Banks Imrie	Mount Royal, Quebec, Canada
*Fay Eugene Larrison	Raleigh
Paul Pincus Lavitt	Hickory
William Frederick Lewald	Brooklyn, N. Y.
Chia-Lo Liu	Chengtu, Szechwan, China
**Arturo Martin de Nicolas y Garcia	Habana, Cuba
William Royall Martin, Jr.	Cary
Edward Gordon Mercer	Burlington
Robert Frederick Miller	Hickory
Vincent George Paul	Hickory
David Alfred Qualls, Jr.	Burlington
James Lacy Sartin, Jr.	Burlington
*Edward Francis Scott	Lisle, Ill.
Jack Willard Swiggett	Raleigh
Otto Teszler	New York, N. Y.
Thurston Adger Wilson, Jr.	Raleigh

PROFESSIONAL DEGREES

CHEMICAL ENGINEER

John Albert Rolston	Raleigh

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* With Honors.

** With High Honors.

CIVIL ENGINEER

IN CIVIL ENGINEERING SOIL MECHANICS AND FOUNDATION OPTION

Robert Burnham Howard, Jr.	Bridgeport, Conn.

IN CIVIL ENGINEERING, STRUCTURAL OPTION

Charles Ervin Warlick, Jr.	Kings Mountain

IN CIVIL ENGINEERING, TRANSPORTATION OPTION

Harold Clingman Rhudy	Greensboro

ELECTRICAL ENGINEER

IN ELECTRICAL ENGINEERING ELECTRIC POWER OPTION

Herbert Mason Paul	Highlands

GEOLOGICAL ENGINEER

Wilbur Cecil Ballance	Portsmouth, Va.

ADVANCED DEGREES

MASTER OF SCIENCE

IN AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Ernest George Beinhart, Jr.	Raleigh
Peter Michael Masley	Clifton, N. J.
Charles Leroy Tucker, Jr.	Winston-Salem

IN AGRICULTURAL ECONOMICS

Frank Howard McDowell	Clyde
Charles Weaver Williams	Cleveland
Dalton Lee Wilson	Plant City, Fla.

IN AGRICULTURAL ENGINEERING

Charles Amos Routh	Winston-Salem

IN AGRONOMY

Rulon Thurston Ashcroft	Hyde Park, Utah
Wilbert Preston Byrd	Burlington
James Ferris Chaplin	Florence, S. C.
Thomas Barksdale Hutcheson, Jr.	Blacksburg, Va.
Jimmie Bob Smith	Hastings, Okla.
Reynold Foy Suman	Gastonia
James Bode Weaver, Jr.	Hartwell, Ga.

IN ANIMAL INDUSTRY

William Lewis Brown	York, S. C.
James Dalton George	Collinsville, Miss.

Van Warren Holsapple	Mitchell, Ind.
Joseph Calbert Johnson, Jr.	Four Oaks
William Forrest Moss	Chattanooga, Tenn.
Virginia Brickle Weldon	Norlina

IN DAIRY MANUFACTURING

Charles Alfred Grosche	Waukegan, Ill.
Harvey Edward Kennedy	Goldsboro
Thomas Boyne Platt	Ames, Iowa

IN ENTOMOLOGY

Stelmon Emerson Bennett	Beckley, W. Va.

IN EXPERIMENTAL STATISTICS

Spencer Michael Free, Jr.	Greensburg, Pa.
Charles Edgar Gates	Washington, D. C.
Miguel Angel Valencia-Rullan	Rio Piedras, P. R.

IN HORTICULTURE

Alva Cled Miller	Rodessa, La.

IN PLANT PATHOLOGY

Donald Franklin Crossan	Wilmington, Del.

IN POULTRY SCIENCE

Grady Allen Martin	Stony Point

IN WILDLIFE CONSERVATION AND MANAGEMENT

Howard James Stains	Frenchtown, N. J.

IN INDUSTRIAL PSYCHOLOGY

John Bonder	Jersey City, N. J.
Bruce Fraser Gordon	Raleigh
Donald Francis Haggard, Jr.	Traverse City, Mich.
Nancy Kay Hoffman	Endicott, N. Y.
Thomas Wilson Lauderdale, Jr.	Kenmore, N. Y.
James Winford Parker, Jr.	Burlington, Vt.
Vara Merritt Smith	Raleigh
Andrew Harriss Symmes	Raleigh
William Brewster Walker	Durham

IN CERAMIC ENGINEERING

James Howard Giles, Jr.	Charlotte
Bobby Lawrence Joyner	Raleigh
George Dollar White	Florence, Alabama

IN CHEMICAL ENGINEERING

David Kelsey Whittington	Natural Bridge, Va.
Charles Ellis Winslow, Jr.	Norfolk, Va.

IN CIVIL ENGINEERING

John Robert Adams	Greensboro
William Andes Hoyt	Maryville, Tenn.
Russell Leighton Twing, Jr.	Waynesboro, Va.

IN DIESEL ENGINEERING

Henry Ernest Keniston, Jr.	Manchester, N. H.
Conrad Racine Odden	Garden City, N. Y.
Lloyd Walter Ream	Windber, Pa.
Clayton Lewis Reed	Nunn, Colorado

IN ELECTRICAL ENGINEERING

Lewin Thompson Baker	Port Allegany, Pa.
Charles Alfred Blackburn	Takoma Park, Md.
Alfred John Goetze	Abington, Pa.
Walter Richard Peck	Asheville
Henry Moss Summer	Fort Valley, Ga.
Edwin Harrison Tompkins, Jr.	Norfolk, Va.
George Newton Webb	Raleigh

IN ENGINEERING MATHEMATICS

Peter Shahdan	Fall River, Mass.

IN ENGINEERING MECHANICS

Forest Joseph Myers	Coldwater, Ohio

IN ENGINEERING PHYSICS

James Fletcher Andrew	Greensboro
Aurie Sanford Myers, Jr.	Lexington
Esther Davis Robinson	Chattanooga, Tenn.

IN GEOLOGICAL ENGINEERING

Clyde Randolph Farquhar	Aurora, Missouri

IN MECHANICAL ENGINEERING

Beverly Tucker Fitchett, Jr.	Long Beach, Cal.

IN NUCLEAR ENGINEERING

Paul Baker, Jr.	Ashland, Ky.
Charles Cusworth	Philadelphia, Pa.
John Bertram Dee, Jr.	Raleigh
Charles Richard Foster	Heavener, Okla.
Robert Francis Hegenberger	Maitland, Fla.
Bernice Laverne Jones	Beaufort

Eugene Oliver Kiger	Raleigh
Gustav Edward Lundquist	Chicago, Ill.
George W. McManaway, Jr.	Asheville
John Archer Poulson	Auburn, N. Y.
William Francis Studer	Chesaning, Mich.
Fredrick Robert Westfall	Toledo, Ohio

IN FORESTRY

John David Besse	Butternut, Wisc.

IN WOOD TECHNOLOGY

Raymond Anderson Moore	Montgomery, W. Va.

IN TEXTILE CHEMISTRY AND DYEING

David Marshall Cates	Greensboro
Remzi Pensoy	Istanbul, Turkey

IN TEXTILE MANUFACTURING

Nazir Ahmad	Sargodha, Pakistan
Prakash Chand Kochhar	Delhi, India
Lake Hugh Jameson	Easley, S. C.
William Hugh Rollins	Spindale

MASTER OF AGRICULTURAL EDUCATION

Jerry Baggett Boone	Clinton
Frank Rankin Craig	Mount Holly
Earl Gaylerd Davis	Edneyville
Thomas Loyd Hanes	Ararat
Thomas Newton Hobgood, Jr.	Oxford
Ezra Lewis Howell	Raleigh
Charles Irving Jones	Micro
James Leon Patrick	Chocowinity
George Willard Sledge	Raleigh
Carl Victor Tart	Stovall
Shearin Pleasant Teague	Landis
Charles Braxton Turpin	Mount Airy
Harold Blair Wall	Knightdale
Clarence Lee Warren	Newton Grove

MASTER OF INDUSTRIAL ARTS EDUCATION

Thomas Jefferson Haigwood, Jr.	Laurinburg

MASTER OF INDUSTRIAL EDUCATION

Cleve Edgar Loman	Roanoke, Va.

MASTER OF OCCUPATIONAL INFORMATION AND GUIDANCE

Wilbur Morris Beasley	Raleigh
Neil Harris Behrens	Charlotte

MASTER OF ELECTRICAL ENGINEERING

Preston Douglas Page	Raleigh
Robert Douglas Sidnam	New York, N. Y.

MASTER OF ENGINEERING MATHEMATICS

Charles Noel Anderson	Macclesfield
LeRoy Brown Martin, Jr.	Raleigh

MASTER OF FORESTRY

Thomas Joseph Ginn	Dover, N. H.
Theodore George Whippie	Winchester, N. H.
Stuart Davis Wiggin	Sanbornville, N. H.

DOCTOR OF PHILOSOPHY IN AGRICULTURAL ECONOMICS

Louis Murdock Smith, Jr.	Raleigh
Joseph Gwyn Sutherland	Raleigh

IN AGRONOMY

Moyle E. Harward	Provo, Utah
Dale Allen Ray	Boggstown, Ind.
Milton Salomon	Kingston, R. I.

IN ANIMAL INDUSTRY

George Elliott Hawkins, Jr.	Princeton, Ky.
William Wesley Garry Smart, Jr.	Shelby

IN DAIRY MANUFACTURING

Robert Burrett Redfern	Mount Croghan, S. C.

IN EXPERIMENTAL STATISTICS

Edwin Lory Cox	Moncton, New Brunswick, Canada
Amode Ranjan Sen	Lucknow, India
Geoffrey Stuart Watson	Bendigo, Victoria, Australia

HONORARY DEGREES

DOCTOR OF AGRICULTURE

Judge Junius Greene Adams	Asheville

DOCTOR OF ENGINEERING

Luther Wilson Greene	Aberdeen, Md.

DOCTOR OF FOREST SCIENCE

Carl Alwin Schenck	Hassen, Germany

DOCTOR OF TEXTILE SCIENCE

William Hagwood Ruffin	Durham

MEDALS AND PRIZES
for the
COLLEGE YEAR 1951-1952

SCHOOL OF AGRICULTURE

Alpha Zeta Scholarship Cup

Joseph Conrad Glass, Jr., Sophomore, Experimental Statistics, Raleigh, N. C.

Alpha Zeta Scholarship Award

George Herman Porter, Freshman, Agricultural Education, Goldsboro, N. C.

Agricultural Engineering Certificate of Recognition

(a) Thomas Harold Garner, Senior, Agricultural Engineering, Farmer, N. C.
(b) Frederick Zane Blevins, Senior, Agricultural Engineering, West Jefferson, N. C.

Agronomy Scholarship Cup

Robert Edmund McCollum, Graduate, Agronomy, Reidsville, N. C.

Agronomy Leadership Cup

George Richard Gwynn, Senior, Agronomy, Yanceyville, N. C.

Burpee Horticulture Scholarship Award

Benjamin Harold Brown, Junior, Horticulture, Rockwell, N. C.

Danforth Junior Fellowship

Bobby Lee Cockerham, Junior, Agricultural Education, State Road, N. C.

Gamma Sigma Epsilon (Chemistry) Cup

Rolf Kaufman, Senior, Chemical Engineering, Waynesville, N. C.

I. O. Schaub Scholarship Award

Bayne Elmo Miller, Freshman, Agriculture (P.V.), Mocksville, N. C.

Sears Sophomore Scholarship Award

Johnny Kermit Atwell, Sophomore, Animal Industry, China Grove, N. C.

Swift Essay Contest

John Robert Williams, Junior, Animal Industry (P.V.), Raleigh, N. C.

SCHOOL OF DESIGN

American Institute of Architects Gold Medal Award

Albert Barnes Cameron, Professional, Architecture, Charlotte, N. C.

American Institute of Architects Book Award

Elizabeth Bobbitt Lee, Professional, Architecture, Lumberton, N. C.

North Carolina Chapter of the American Institute of Architects Book Award

Richard Pleam Leaman, Professional, Architecture, Lancaster, Pa.
and Albert Barnes Cameron, Professional, Architecture, Charlotte, N. C.

Thirty-ninth Paris Prize in Architecture
($5,000 cash award for study abroad)

Edward Harper Shirley, Senior, Architecture, Greenville, S. C.

SCHOOL OF EDUCATION

Kappa Phi Kappa Scholarship Medal

George Eugene Spain, Senior, Agricultural Education, Henderson, N. C.

SCHOOL OF ENGINEERING

Outstanding Senior in the School of Engineering

Wesley Osborne Doggett, Senior, Nuclear Engineering, Brown Summit, N. C.

Ceramics Awards

(a) J. C. Steele Scholarship Cup (Upperclassman)

Keith Tipton Corbett, Jr., Junior, Ceramic Engineering, Morristown, Tenn.

(b) Moland-Drysdale Scholarship Cup (Freshman)

Henry Chovine Croom, Freshman, Ceramic Engineering, Wilson, N. C.

American Institute of Chemical Engineers Certificate

Edgar Durant Skinner, Jr., Junior, Chemical Engineering,
Rocky Mount, N. C.

Chi Epsilon (National Civil Engineering Honorary Fraternity) Award

William Patrick Taylor, Sophomore, Civil Engineering, Goldsboro, N. C.

Eta Kappa Nu (Electrical Engineering Honorary Fraternity) Award

Frank Addison Hargrove, Sophomore, Electrical Engineering,
Scotia, New York

American Institute of Electrical Engineers Certificate

Arthur William Vernon, Senior, Electrical Engineering, Hampton, Virginia

American Society of Mechanical Engineers Certificate

William Earl Waddell, Senior, Mechanical Engineering, Rocky Mount, N. C.

Pi Tau Sigma (Mechanical Engineering Fraternity) Award

Ralph E. Deitrick, Sophomore, Mechanical Engineering (Aero. Option),
Winston-Salem, N. C.

Tau Beta Pi Scholarship (National Engineering Fraternity) Cup

Donald Hasbrouck Kline, Jr., Asheville, N. C.

SCHOOL OF FORESTRY

The Hulda Johnson Cox Scholarship

Charles Franklin Raper, Jr., Jun., For. Mgt., Arlington, Virginia

Xi Sigma Pi Scholarship (Senior)

James Dan Crook, Jr., Sen., For. Mgt., Asheville, N. C.

Xi Sigma Pi Scholarship (Freshman)

John Wallace Tester, Fr., Forestry, Lenoir, N. C.

SCHOOL OF TEXTILES

Sigma Tau Sigma (Honorary Textile School Fraternity) Scholarship Cup

Phillip William Siegel, Senior, Textiles, Union City, New Jersey

Phi Psi (Textile School Fraternity) Scholarship Award (Outstanding graduating senior in the School of Textiles)

Monroe Sheldon Brettler, Senior, Textiles, New York, New York

American Association of Textile Technologists Certificate

Monroe Sheldon Brettler, Senior, Textiles, New York, New York

American Association of Textile Chemists and Colorists Certificate

Arturo Martin de Nicholas, Senior, Textiles, Havana, Cuba

MILITARY DEPARTMENT

American Legion Medal

Cadet Lt. Colonel Wesley Osborne Doggett (AFROTC), Senior, Nuclear Engineering, Brown Summit, N. C.

The Major General William C. Lee Scholarship Award

Cornelius David Sides, Jr., Concord, N. C.

PHI KAPPA PHI MEDALS

Graduate Scholarship Award

Harold A. Ramsey, Graduate, Animal Industry, Uniontown, Kansas

Senior Scholarship Awards (Gold Medal)

(a) Wesley Osborne Doggett, Senior, Nuclear Engineering, Brown Summit, N. C.

(b) Gerard Francis Helfrich, Graduate, Nuclear Engineering, Dallastown, Pa.

(c) Eugene Clemens Sakshaug, Senior, Electrical Engineering, Flasher, North Dakota

Junior Scholarship Award (Silver Medal)

Donald Hasbrouck Kline, Junior, Civil Engineering, Asheville, N. C.

Sophomore Scholarship Award (Bronze Medal)

Earlie Hobart Spainhour, Sophomore, Industrial Engineering, Rural Hall, N. C.

ATHLETIC AWARDS

Alumni Athletic Trophy

Walter Lee Terrill, Senior, Textiles, South Orange, New Jersey

Monogram Club Freshman Athletic Cup

Robert Erwin Mattson, Freshman, Textiles, Worchester, Mass.

INDEX

Page

Administration, Officers of, State College ... 7
Administrative Council of the Consolidated University ... 6
Admission ... 34, 179
Advanced Standing ... 36, 38
Aeronautical Option ... 153, 299
Agricultural and Biological Chemistry ... 78, 92
Agricultural Economics ... 79, 182
Agricultural Education ... 109, 186
Agricultural Engineering ... 78, 80, 188
  Farm Structures ... 83
  Land Improvement ... 83
  Power and Machinery ... 83
  Rural Electrification ... 83
Agricultural Experiment Station ... 100
Agricultural Extension ... 101
Agriculture, Description of Courses ... 192
Agriculture, School of ... 76
  Agricultural and Biological Chemistry ... 78, 92
  Agricultural Engineering ... 78, 80, 188
  Biological Sciences, Division of ... 87
  Biology ... 199
  Dairy Manufacturing ... 78, 87, 224
  Degrees ... 78
  Experiment Station ... 100
  Extension Work ... 101
  General Agriculture ... 76, 192
    Agricultural Economics ... 79, 182
    Agronomy ... 83, 192
    Animal Industry ... 86, 195, 224
    Botany ... 88, 199
    Chemistry ... 92, 210
    Entomology ... 88, 250
    Genetics ... 89, 259
    Horticulture ... 93, 267
    Plant Pathology ... 89, 320
    Poultry Science ... 95, 321
    Rural Sociology ... 98, 328
    Statistics ... 99, 334
    Zoology ... 90, 350
  Short Courses ... 79
  Specialized Curriculum ... 77
  Wildlife Conservation and Management ... 78, 90
Agronomy ... 83, 192
Air Science and Tactics ... 54, 304
Alumni Association ... 67
Animal Industry ... 86, 195, 224
Applicants, Information for
  Admission ... 34
  Expenses ... 36
  Financial Aids and Scholarships ... 39
  Registration ... 44
  Self-Help ... 65
Architecture ... 103, 198
Athletics and Physical Education ... 57, 63
Auditors, Fees ... 39
Awards ... 62, 382

Biological Sciences, Division of ... 87
  Biology ... 199
  Botany ... 88, 199
  Entomology ... 88, 250
  Genetics ... 89, 259
  Plant Pathology ... 89, 320
  Zoology ... 90, 350
Biology ... 199
Board ... 38
Board of Trustees of the Consolidated University of North Carolina ... 4
Botany ... 88, 199
Buildings, General Service ... 33

Page

Calendar, College ... 2
Calendar, 1953-54 ... 3
Ceramic Engineering ... 126, 202
Chemical Engineering ... 128, 205
Chemistry ... 92, 210
  Agricultural and Biological ... 78, 92
  Textile ... 172, 178, 347
Civil Engineering ... 131, 215
  Construction ... 133
  Sanitary ... 132
  Soil Mechanics and Foundation ... 133
  Structural Engineering ... 133
  Transportation ... 133
Classification of Students ... 49
Clubs and Societies ... 59
College, The ... 32
College, Extension ... 179
College Foundations ... 68
College Policy ... 8
College Publications ... 66
Commencement, 1952 Degrees Conferred 359
Construction ... 133
Cooperative Agricultural Extension Work ... 101
Correspondence Division ... 179
Curricula: See School, Department or Division Concerned

Dairying, Animal Industry and Dairy Manufacturing ... 78, 86, 87, 195, 224
Degrees ... 50
  Conferred, 1952 ... 359
  Graduate ... 179
  School of Agriculture ... 78
  School of Design ... 103
  School of Education ... 108
  School of Engineering ... 122
  School of Forestry ... 156
  School of Textiles ... 167
Description of Courses (Alphabetical Order by Departments) ... 182
Design, School of ... 102, 226
  Architecture ... 103, 198
  Landscape Architecture ... 105, 285
  Library ... 54
Diesel Engineering ... 135, 228
Division of Biological Sciences ... 87
Division of Graduate School ... 179
Dormitories ... 33
Driver Training School ... 180

Economics ... 74, 230
  Agricultural ... 79, 182
Education, School of ... 108, 235, 272, 311
  Agricultural Education ... 109, 186
  Industrial Arts Education ... 111, 270
  Industrial Education ... 113, 270
  Industrial and Rural Recreation 115, 280
  Mathematics and Science Education ... 116, 292
  Occupational Information and Guidance ... 118, 311
  Psychology ... 118, 324
Electrical Engineering ... 136, 236
Engineering Mathematics ... 150
Engineering Mechanics ... 139, 243
Engineering Physics ... 141
Engineering Research ... 140
Engineering, School of ... 120
  Organization, Purpose, Requirements ... 120
  Aeronautical Option ... 153, 299
  Ceramic ... 126, 202
  Chemical ... 128, 205
  Civil ... 131, 215

Page
  Construction 133
  Curricula Offered 122
  Diesel 135, 228
  Electrical 136, 236
  Engineering Mathematics 150
  Engineering Mechanics 139, 243
  Engineering Physics 141
  Engineering Research 140
  Freshman Curriculum 125
  Functional Departments 120
  Furniture Manufacturing and Management 148
  Geological 144, 261
  Heating and Air Conditioning 153
  Humanities—Social Studies Program 125
  Industrial 146, 275
  Industrial Employment Requirement 123
  Inspection Trips 124
  Line Departments 120
  Mathematics 150, 286
  Mechanical 151, 293
  Nuclear 142
  Physics 141, 315
  Professional (Fifth Year) 122, 123
  Sanitary 132
  Short Courses 124
  Soil Mechanics and Foundation 133
  Structural 133
  Transportation 133
English 74, 246, 309
Enrollment, Summary of 355, 358
Entomology 88, 250
Equipment and Facilities (See each School, Department, Division.)
Executive Committee of the Board of Trustees 6
Expenses 36
Experiment Station, Agricultural 100
Experimental Statistics 99, 334
Extension, Agricultural 101
Extension, College 179

Fabric Development and Construction 171
Faculty Council 7
Faculty, Officers of Instruction 9
Farm Structures Option 83
Fees 37, 38
Fellowships 44, 159
Financial Aids and Scholarships 39, 159
Forest Management 160
Forestry, School of 156
  Curricula offered 159
  Description of Courses 252
  Fellowships, Scholarships and Loan Funds 159
  Field Instruction and Experience 158
  Forest Management 160
  Lumber Products Manufacturing and Merchandising 165
  Pulp and Paper Technology 163
  Short Courses 159
  Wood Technology 162
Foundations, College 68
Fraternities, Honor 59
  Social 61
French 305
Furniture Manufacturing and Management 148

General Information 32
General Studies, School of 73
Genetics 89, 259
Geography 260
Geological Engineering 144, 261
Geology 261
German 306
Government, Campus 58
Grades and Honor Points 45, 46

Page
Graduate Division, Organization, Fellowships, Admission, Degrees, Regulations 44, 50, 179
  Fees 38
  Graduate Students with Appointments 31
Graduates, 1952 359
Graduation requirements for:
  Graduate Division 179
  School of Agriculture 77, 78
  School of Design 105, 107
  School of Education 108
  School of Engineering 122
  School of Forestry 156
  School of Textiles 167

Health of Students 51
Heating and Air Conditioning 153
History and Political Science 74, 264
Honor Fraternities and Societies 59
Honor Points 46
Honor System 58
Honors in Scholarship 49
Horticulture 93, 267
Humanities—Social Studies Program 125, 331

Industrial Arts Education 111, 270
Industrial Education 113, 270
Industrial Employment Requirement 105, 107, 123, 158
Industrial Engineering 146, 275
Industrial and Rural Recreation 115, 280
Information, General 32
Information for Applicants 34
Inspection Trips:
  Engineering 124
  Forestry 158
  Textiles 168
Institutes 124, 180
Intercollegiate Athletics 63
Intramural Athletics, Physical Education and 57

Knitting 170, 177

Laboratories: See Special Departments In Agriculture, Engineering, and Textiles
Land Improvement Option 83
Landscape Architecture 105, 285
Languages 305
Library 52
Library, Design 54
Library, Textiles 54, 174
Loan Fund, Students 39, 159
Lumber Products Manufacturing and Merchandising 165

Machine Design and Development 174
Mathematics 150, 286
Mathematics and Science Education 116, 292
Mechanical Engineering 151, 293
  Aeronautical Option 153, 299
Medals and Prizes 62, 382
Military Science and Tactics 301
Military Staff, Special 8
Military Training 54
Modern Languages 74, 305
Music 65

Nonresident Students 36
Nuclear Engineering 142

Occupational Information and Guidance 118, 311

Page

Officers:
  Administration of State College 7
  Administrative Assistants 8
  Administrative Council of the Consolidated University 6
  Executive Committee of the Board.. 6
  Faculty Council 7
  Instruction: Faculty of State College 9
  Other Administrative Officers 7
  Special Military Staff 8
  Special Officers 8
  Trustees 4
Organizations 59

Philosophy and Religion...........75, 312
Physical Education and Intramural Athletics 57, 75, 314
Physics 141, 315
Plant Pathology 89, 320
Policy, College 8
Political Science, History and...74, 264, 266
Poultry Science....................95, 321
Power and Machinery Option 83
Professional (Fifth Year) 122, 123
Psychology 118, 324
Publications:
  College 66
  Agricultural Experiment Station 100
  Engineering Research 140
  Student 59
Pulp and Paper Technology 163

Quality Control Option 177

Recreation, Industrial and Rural...115, 280
Refunds 37, 38
Registration 44
Religion, Philosophy and...........75, 312
Requirements for Admission........34, 179
Research, Engineering............... 140
Research, Textile 173
Reserve Officers Training Corps....... 54
Rooms, Dormitory 33, 37, 38
Room Rent 37
Rural Electrification Option.......... 83
Rural Sociology 98, 328
Russian 309

Sanitary Engineering 132
Scholarship Requirements............. 44
Scholarships and Awards 62, 382
Scholarships, Financial Aids and ...39, 159
School of Agriculture 76
School of Design 102
School of Education 108
School of Engineering 120
School of Forestry 156
School of General Studies 73
School, Graduate 179
School of Textiles 166
Schools, Divisions, and Departments .. 73
Science Education 117
Self-Help for Students 65
Short Courses:
  Agriculture 79
  Engineering 124
  Extension 180

Page

  Forestry 159
  Textile 168
Social Studies 75, 125, 331
Societies, Clubs, Fraternities 59, 61
Sociology 75, 331
  Rural 98, 328
Soil Mechanics and Foundation Engineering 133
Spanish 307
Special Student Fees 38
Statistics 99, 334
Structural Engineering 133
Student Activities 58
  Clubs and Societies 59
  Fraternities, Honor 59
    Social 61
  Government and Systems 58
  Publications 59
Student Personnel 51
Summary of Enrollment 355, 358
Summer Work for Engineering Students 123
Synthetic Fibers Division 173
Synthetic Option, Courses 177

Technical Institutes 180
Textile Chemistry 172, 178, 347
Textile Management Option 177
Textile Placement Bureau 175
Textiles, School of: Organization, Purpose, Requirements 166
  Consulting Service 175
  Curricula 176
  Description of Courses 338
  Fabric Development and Construction 171
  General Option 177
  Knitting 170, 177
  Library 54, 174
  Machine Design and Development .. 174
  Placement Bureau 175
  Professorships, Sponsored 175
  Quality Control 177
  Research 173
  Short Courses 168
  Synthetic Fibers, Option, Courses 173, 177
  Textile Chemistry 172, 178, 347
  Textile Management 177
  Weaving and Designing 177
  Yarn Manufacturing 168, 178
Transfer Students 36, 38
Transportation Engineering 133
Trustees, Board of 4
  Executive Committee 6
Tuition and Fees 37

Vaccination 44

Weaving and Designing Option 177
Wildlife Conservation and Management 78, 90
Wood Technology 162

Yarn Manufacturing Option 168, 178
Young Men's Christian Association 64

Zoology 90, 350